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Research & Development Corp

9480 – 4180 - 4280 – 4284 – 4000XA

MULTIPLE PROTOCOL INTEGRATED ACCESS DEVICE USER'S MANUAL

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1 IMPORTANT SAFETY INSTRUCTIONS

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

When installing, operating, or maintaining this equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:

- Read and understand all instructions.
- Follow all warnings and instructions marked on this product.
- For information on proper mounting instructions, consult the User's Manual provided with this product.
- The telecommunications interface should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection.
- This product should only be operated from the type of power source indicated in the User's Manual.
- This unit must be powered from either –48 V DC, or AC voltage sources. Additionally, the **4000XA, 4180** and **4280** may be powered by a 24VDC source. The **4280** may also be powered via the Ethernet Interface.
- The –48 V DC input terminals are only provided for installations in Restricted Access Areas locations.
- Do not use this product near water, for example, in a wet basement.
- Never touch non-insulated wiring or terminals carrying direct current or leave this wiring exposed. Protect and tape wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.
- To reduce the risk of electrical shock, do not disassemble this product. Only trained personnel should perform servicing. Opening or removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect re-assembly can cause electric shock when the unit is subsequently used.
- For a unit intended to be powered from –48 V DC voltage sources, read and understand the following:
  - This equipment must be provided with a readily accessible disconnect device as part of the building installation.
  - Ensure that there is no exposed wire when the input power cables are connected to the unit.
  - Installation must include an independent frame ground drop to building ground. Refer to User's Manual.

This symbol is marked on the **4180**, **4280** and **4284**, adjacent to the ground (earth) area for the connection of the ground (earth) conductor.

- This Equipment is to be Installed Only in Restricted Access Areas on Business and Customer Premises Applications in Accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA No. 70. Other Installations Exempt from the Enforcement of the National Electrical Code May Be Engineered According to the Accepted Practices of the Local Telecommunications Utility.
- For a unit equipped with an AC Wall Plug-In Unit, read and understand the following:
  - For the **4280**, use only the PHIHONG, Model PSA-30U-240 power supply adapter.
  - For the **4000XA or 4180**, use only the K'TRON, Model KA-52A Wall Plug-In power supply adapter.
  - For the **9480** or **4284**, use only the Astrodyne Part # SPU15A-111 48 volt power supply adapter.
  - Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
  - Do not staple or otherwise attach the power supply cord to the building surfaces.
  - Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.
  - The socket outlet shall be installed near the equipment and shall be readily accessible.
  - The Wall Plug-In unit may be equipped with a three-wire grounding type plug, a plug having a third (grounding) pin. This plug is intended to fit only into a grounding type power outlet. Do not defeat the safety purpose of the grounding type plug.
  - Do not allow anything to rest on the power cord. Do not locate this product where persons walking on it may abuse the cord.
  - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
    a) When the powers supply cord or plug is damaged or frayed.
    b) If liquid has been spilled into the product.
    c) If the product has been exposed to rain or water.
    d) If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by qualified technician to restore the product to normal operation.
    e) If the product has been dropped or the cabinet has been damaged.
    f) If the product exhibits a distinct change in performance.

SAVE THESE INSTRUCTIONS

2 INTRODUCTION

The **9480, 4180, 4000XA, 4284, *and* 4280** are Multiple Protocol Inter-Networking devices. In this document, the term **xxxx** or **unit** will mean any of these devices.

The **4000XA, 4180**, **4280**, **9480**, **and 4284** include optional enhanced vertical service feature packages such as X.25 mediation in various capacities. The **9480** and **4284** also support the E2A Bridge Network emulation feature package. Other feature packages are similarly available.

The **4000XA** and **4180** support a Time Slot Router (TSR) port. The TSR port allows transport of proprietary protocols on DS0s, or aggregated on a DS1. The T1, E1, and J1 formats are all supported.

The **4000XA** and **4180** support an IP-GATE LAN interface for providing a VPN service with disjoint addressing. The ***IP-GATE*** port provides access to a secure and reliable virtual private network separate from the other functions of the **4180**. It provides an inter-LAN networking connection over an IP network that would otherwise not be secure enough to carry this traffic. This provides complete connectivity with any remote **IP-GATE** via an IP network. Many hardware variations support an IP-GATE. For example, a **2020** [1]+ SAM + **IP-GATE** combination provides such a connection. Similarly, **IP-GATE** ports on two **4180**s can communicate with each other over an IP network. An **IP-GATE** resident on a BNS network may be used as a peer by interfacing through the Universal Mediation Interface (**UMI**) Module. If it is desirable to provide access to a LAN in a central site from a large number of remote sites, the ***IP-GATE*** port on the main-site **4180** can be configured to interconnect with the **IP-FANOUT** application on a **6xxx Embedded Network Processor** located anywhere on the IP network. Please see the Solution Document "*Secure and Reliable Intranet Access For Remote Sites"* for a more detailed discussion of this use of the **IP-FANOUT** application on the **6xxx**.

The **9480** is a single port device, the **4284** has 4 serial ports, the **4000XA** and **4180** each have 16 serial ports, and the **4280** has 32 serial ports. All of the serial ports are synchronous, or asynchronous that support speeds up to 115.2kbps. Popular protocols such as Asynchronous, various Bi-Synchronous variants, HDLC, SDLC, X.25, and E2A are all supported interchangeably on a per-port basis.

In addition, vertical services typically found on Embedded Network processors have been incorporated into the devices as feature packages. For example, this allows for the direct mediation of X.25 to individual circuits over TCP connections when the X.25 vertical service is selected on a port. The **9480** and **4284** devices also allow the emulation of the E2A Bridge network when the **E2AHOB** vertical service is selected on a port.

[1] The **2020** is a stand-alone unit, which interfaces an existing SAM to an IP network instead of a BNS network. This gives IP network access to devices connected to the SAM ports without any re-cabling.

The **xxxx** is an internet protocol (IP) access device. That is, it mediates any of the supported protocols and the IP protocol suite. This includes IP, TCP, Telnet, RTP, ARP, SNMP, etc.

The **4000XA, 4180**, **4280**, **4284**, and **9480** hardware is each individually unique, but comparable to the **4000**. The **4000XA** hardware is identical to the **4000** as it is an in situ software conversion. The notable differences are power options, number of ports, serial port type, and the 10BaseT vs 10/100 LAN connection for IP connectivity. The **xxxx** series provide expanded or additional feature packages.

The **4280** allows 48VDC, nominal 24VDC (18-72V), or AC via a power cube. In addition, the **4280** may be supplied by ***Power over Ethernet*** **(POE)** on the LAN port thereby eliminating any power connection.

The **9480**, and **4284** hardware are similar to the **4280** except the power options are 48VDC nominal, **Power over Ethernet (POE)**, or AC via the power cube. Notably missing is the nominal 24VDC (18-72V) power option present on the **4280**.

The **4180** allows 48VDC (18-72V), 5VDC, or AC via a power cube. The **4180** does not support Power over **Ethernet(POE)**.

2.1 CLOSED USER GROUPS

This is an important feature for protecting sensitive endpoints in a corporate-wide network without the burden of special “security servers”. The **xxxx** provides security with an implementation of Closed User Group (CUG) membership and calling security. This is a capability similar to that provided in X.25 networks but now available for an IP infrastructure. A closed user group restricts access between **xxxx** ports and domains or individual endpoints in the IP network. No external security systems of any kind are required. A CUG application example is presented at the end of this manual.

2.2 HUNT GROUPS

A Hunt Group is a set of ports arranged to receive calls to a common address. The **xxxx** provides this capability for user ports configured to receive calls from the IP network.

2.3 DNS FEATURES

The **xxxx** can maintain a set of mnemonic host names, analogous to the */etc/hosts* file on both UNIX and Microsoft Windows platforms. This allows the **xxxx** to perform a translation between a user-provided name and its associated IP address and TCP port number. (The use of a mnemonic name is optional, as the **xxxx** will always accept an IP address in its numeric form.) The **xxxx** also allows for the definition of an external Domain Name Server (DNS) to be used for mnemonic addresses not defined in the host table. Multiple Domain Name Servers are supported. They are searched in priority order.

2.4 TACACS+ RADIUS LOGIN Support

The **xxxx** supports up to two TACACS+ RADIUS servers for login authentication. These are a primary, and a secondary, although each is individually enabled. The TACACS+ support is for either encrypted, or clear authorization. Encryption keys may contain spaces.

2.5 ALARM RELAY UNIT ALARM GRID INTERFACE

The **4000XA, 4180**, and the **4280**, each provide a standard wiring for activation of the alarm grid should the hardware encounter a fault condition. The fault conditions include a total loss of power to the device. The alarm grid interface may be wired for normally open or normally closed connections.

2.6 Peer To Peer Secure Socket Cryptography

The **xxxx** will support peer to peer communications using secure cryptography. This is important for Internet Protocol (IP) networks where the contents of the peer session is to be protected from network *sniffer* devices. The cryptography feature is selectable on a per port basis, and both session endpoints should be set identically. The cryptography key selection is dynamic, and automatic.

2.7 X.25 Mediation Features

The **4280** has thirty two instances of the X25PAD mediation application.
The **4180** has sixteen instances of the X25PAD mediation application.
The **4000XA** has sixteen instances of the X25PAD mediation application.
The **4284** has four instances of the X25PAD mediation application.
The **9480** has one instance of the X25PAD mediation application.

Use of the X25PAD application is exclusive of any other vertical service application (e.g. E2AHOB) or feature package.

Each of the serial ports on these devices may be connected to a (B)X.25 interface. The X25PAD mediation application allows a telnet client to interface on a per VC basis. In addition, X.25 pass-through for VC aggregation is fully supported. Each VC may be individually configured as a PAD or a PASS-THROUGH interface. A specialty interface for the MacStar operations system is supported. The *Record Boundary Preservation* protocol is supported. SVC hunt groups across X.25 lines are specifically supported allowing fault tolerant X.25 links to be established. The (B)X.25 session layer is specifically supported via an API.

2.8 Time Slot Router (TSR) Features

The **4180** provides one RJ48C for a TSR interface. The RJ48C supports T1, E1, or J1 software configurable. Each time slot may be uniquely routed on the IP WAN. Individual CODECs may be installed for load optimization. HDLC time slots may be terminated for use by **6xxx** applications, or for routing to serial ports.

2.9 E2A Head of Bridge Features

The **4280** does not support the **E2AHOB** mediation application at this time.
The **4180** does not support the **E2AHOB** mediation application at this time.
The **4000XA** does not support the **E2AHOB** mediation application at this time.
The **4284** has four instances of the **E2AHOB** mediation application.

The **9480** has one instance of the **E2AHOB** mediation application.

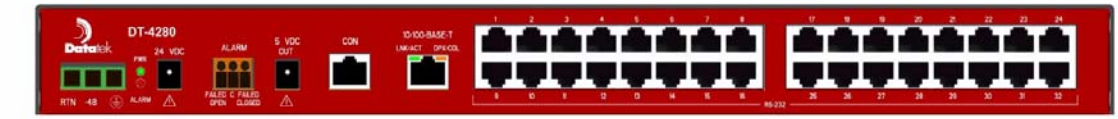
Use of the **E2AHOB** application is exclusive to any other vertical service application (e.g. X25PAD) or feature package on a particular port.

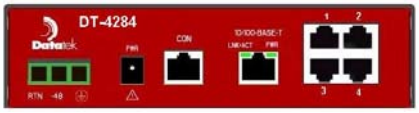
Each of the serial ports on these devices may be configured, on a per port basis, to be connected to an E2A head of bridge. The head of bridge may be an E2A port on an OS such as NMA, an intermediary device such as a TNC, or merely a modem in an existing bridge chain. The **E2AHOB** mediation application allows a switched virtual bridge network to be created using standard E2A ports on the same or other devices. A virtual distribution bridge of up to 31:1 may be created in this manner. The **E2AHOB** provides a display of the dynamic address map, and a full decoding protocol snooper. The **E2AHOB** has provision for display of the dynamic E2A address map, and an E2A decoding protocol snooper.

2.10 eSAM Extension Board Support

The devices may be used as an extension *board* to a **eSAM**. The **eSAM** is a network extensible variant of the SAM series for Datakit and BNS networks. This feature allows the device to be used as a single port, four port, sixteen port, or 32 port *board* to extend a **eSAM**. The device does not need to be co-located with the **eSAM** as it uses the IP infrastructure for communications. See the **eSAM** product addendum for more information.

3 PHYSICAL DESCRIPTION





3.1 POWER INTERFACES

48VDC Power

Rack-mounted or operating stand-alone, the **4180**, **4280**, **4000XA**, and **4284** accept DC power input directly from a 48V DC power source which connects to the three position (return, -48, and ground) terminal block labeled 48V DC on the faceplate. The terminal block connectors accommodate 10 awg (American Wire Gauge) to 14 awg wire. A strain-relief clamp is available separately for DC wire stabilization. The actual voltage range of the **4180**, **4280**, and **4000XA** is 18 through 72 volts inclusive.

The **9480** accepts 48VDC power on a circular connector. The **9480** voltage tolerance is +/- 10%. The **4284** voltage tolerance is +/- 10%.

24VDC Power

Rack-mounted or operating stand-alone, the **4280** accept DC power input directly from a 24 VDC (nominal) via a circular connector. The circular connector is labeled 24VDC on the **4280** faceplate. The actual voltage range is 18 through 72 volts inclusive.

AC Power

For this application, a separate AC power supply is available which plugs into a standard 115/240V AC outlet. The power supply has a six-foot cable that terminates with a barrel connector. The barrel connector plugs into the circular connector labeled 24VDC on the **4280** faceplate. The barrel connector plugs into the circular connector labeled 5VDC on

the **4000XA** and **4180** faceplate. The AC power cube plugs into the circular connector labeled 48VDC on the **4284**, and the **9480**.

Power Over Ethernet
The **4280**, **4284**, **and 9480** will accept power on the LAN connection using the **POE** specification. When used, no additional power is required by the device.

Redundant Power
The **4280**, **4284**, and **9480** may be connected to power on each of their supported interfaces. For example, the "**Power over Ethernet**" may be used at the same time as 48V power on the circular connector. The power supplies are isolated from each other and completely redundant. If one should fail, the other is used without interruption. Note that the **4280** may be triple redundant with **Power over Ethernet**, 48V on its 3-prong interface, and 18-72v on its circular connector.

3.2 ALARM RELAY UNIT INTERFACE

The Alarm Relay Unit connector is a three position (Failed Open, Closed, Failed Closed) terminal block labeled ALARM on the **4000XA**, **4180** or **4280** faceplate. The terminal block connectors accommodate 10-awg to 14-awg wire.

3.3 CONSOLE INTERFACE

The console interface is used for initial configuration, and for StarKeeper® II NMS monitoring on an on-going basis.[2]
This interface requires a standard RJ45-terminated twisted-pair data cable on the **4000XA**, **4180**, **4280**, and **4284**. It connects as a data terminating equipment (DTE) to an asynchronous device and uses RS-232C signaling. It is configured as 9600 bps, 8 bits, no parity and one stop bit.
On the **9480**, the serial console interface is available on the secondary port pins of the DB25 connector (Pins 14 & 16). Once initially configured, all operations may use the telnet console.

3.4 4180 RS-232/V.11/RS-530SERIAL INTERFACE

The DB25 RS-530 male connector on the **4000XA** and **4180** provides support for software-selectable device interfaces (V.35 and RS232-C) at data rates up to 2Mbps. The DB25 RS-530 interface is a DTE only. The male connector electrically presents a data terminal equipment (DTE) interface and supports RS-232C directly. For V.35, a standard RS-530 DB25 Female to V.35 Winchester-34 Male adapter is available.

[2] The **xxxx** also provides access to the console function through a TCP telnet connection via a reserved telnet server port (TCP port 1023). This service is available only when the unit is in service, and may be protected by Closed User Group membership.

3.5 10/100 BASE-T INTERFACE

The LAN connection on the **4280**, **4284**, and **9480** is a 10/100 BaseT interface on the front of the unit and is labeled “LAN”. The interface requires a standard RJ45 terminated Category 5 twisted-pair data cable. It connects to a 10/100 Hub, EtherSwitch, or router on a local LAN segment providing access to a wide-area IP based network. This port supports TCP/IP peer-level protocols (e.g. TELNET, TCP, IP, ARP, SNMP, etc.). The LAN interface will automatically negotiate the speed with the network interface PHY. The **4000XA** and **4180** provides two LAN connections with similar interface capable of 10BaseT operation. These are labeled LAN and GATE for their distinct functions.

3.6 TSR

The **4000XA** and **4180** DSU interface uses an industry-standard RJ48C connector. The option of using the interface for T1 (1.544 MHz) or E1 (2.048 MHz) is software selectable. The TSR is used to transport individual time slots with on T1/E1 interfaces.

3.7 USER PORTS

The user serial ports support both asynchronous and synchronous protocols in either DCE or DTE modes. Configuration is selectable on a per port basis. Baud rates up to 115.2kbps are supported. Synchronous ports support NRZ & NRZI. The NRZI format supports recovered clocks for isochronous (i.e. 2 wire) operation.

The V.35 and RS-530 interfaces require a **9008** adapter, or a **9116** intelligent patch panel. The RS-232 physical interface may be done via the **9116** intelligent patch panel, or directly from the user port interface. When using a RJ45 interface, an industry standard RJ45 to DB25 adapter is utilized. The **9008** adapter and the **9116** intelligent patch panel each provides a DB25 interface. See the cabling information contained in this user manual.

3.8 LEDs

The faceplate contains light emitting diodes (LEDs) used to report **4000XA** or **180** activity and status.

LED Function	LED Color	LED Description
PWR	Green	Unit Power Indicator
ALARM	Red	Reset Indicator & General Failure Indicator
LNK (each PHY)	Green	LAN Link Indicator
COL (each PHY)	Red	LAN Collision Indicator
RX (each PHY)	Yellow	LAN Receive Packet Indicator
TX (each PHY)	Yellow	LAN Transmit Packet Indicator
TSR	Red	LOS Indicator

The faceplate contains light emitting diodes (LEDs) used to report **4280** activity and status.

LED Function	LED Color	LED Description
PWR	Green	Unit Power Indicator
ALARM	Red	Reset Indicator & General Failure Indicator
LNK/ACT	Green	Link & Activity (Blink) Indicator
DPX/COL	Red	Duplex & Collision (Blink) Indicator

The **4284**, and the **9480** use the following light emitting diodes:

LED Function	LED Color	LED Description
PWR	Green	Unit Power Indicator
LNK/ACT	Green	Link & Activity (Blink) Indicator

4 INSTALLATION

This chapter contains the steps needed to install and cable the **4xxx**. The **9480** is directly attached to the network element via a DB25 interface. A #2 Phillips and medium-sized flathead screwdrivers are required.

4.1 REQUIRED EQUIPMENT

To install either a rack-mounted or stand-alone device, the following items are needed:

- One **4000XA**, **4180**, **4280**, **4284**, **or 9480** unit
- For AC operation, AC power supply
- For DC operation, a strain-relief clamp for wire stabilization

Cables – refer to CABLING sections **4.4** through **4.7** below to determine specific requirements for this installation. ***Note: Shielded cables must be used in order to maintain compliance with EMC requirements.***

For rack-mount installations only:

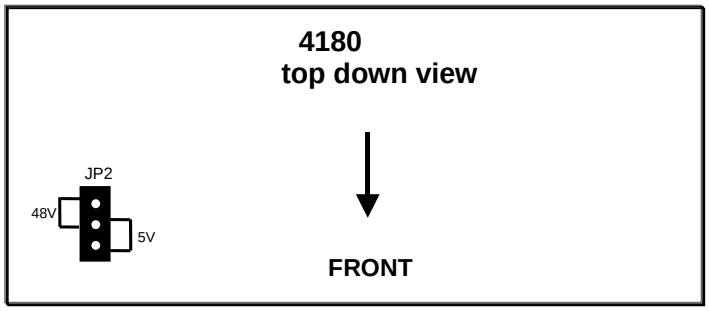
- An EIA standard 19-inch or 23-inch equipment rack with internal, vertical mounting rails. Hole spacing on the vertical-mounting rail must be 1.25 inches. Use the dimension specifications to calculate how high the rack needs to be to support the required number of units.
- A pair of mounting brackets for each **4000XA**, **4180**, or **4280.** The **4284** uses the IP-DSU mounting bracket.
- The Environmental Operating Range of 5 to 40 degrees C (41 to 124 degrees F) is necessary to maintain compliance with UL.

4.2 INSTALLATION FOR AC-ONLY OPERATION

1) *Stand-Alone:* Attach the provided feet to the bottom of the unit
   Rack-Mount: Attach the mounting brackets to each side of the unit.
2) *Stand-Alone:* Place the unit in the desired location, such as a shelf in a data equipment rack.
   Rack-Mount: Fasten the unit to a 19-inch equipment rack (using appropriate rack screws) or use extension ears for a 23-inch rack.
3) Attach data transport cables – refer to section **4.5**
4) Attach console cable by plugging one end of an RJ45-terminated twisted-pair data cable into the console interface and the other into the port of the asynchronous device that will be used to configure or manage the unit.
5) Plug the power supply into a standard 115V AC outlet and the barrel connector on the power supply cable into the appropriate circular connector on the faceplate. Labeled 24VDC on the **4280**, 5VDC on the **4000XA**, and **4180**, and 48VDC on the **4284** and **9480**.

4.3 INSTALLATION FOR DC OPERATION

1. **4000XA** and **4180** Power Strapping. The **4000XA** and **4180** is factory configured for 115V AC usage. 48V DC operation requires a different jumper setting on the **4180** system board. Refer to the diagram below and perform the following steps:



Disconnect any power connectors from the unit. Remove the unit cover, exposing the top portion of the system board. Locate the jumper connector *(JP2)* and move the jumper to the 48v setting. Replace the unit cover.

2. *Stand-Alone:* Attach the provided feet to the bottom of the unit
   Rack-Mount: Attach the mounting brackets to each side of the unit.

3. *Stand-Alone:* Fasten the strain relief to the side of the unit.
   Rack-Mount: Fasten the strain relief to the unit rack-mount bracket.

4. *Stand-Alone:* Place the unit in the desired location, such as a shelf in a data equipment rack.
   Rack-Mount: Fasten the unit to a 19-inch equipment rack (using appropriate rack screws) or use extension ears for a 23-inch rack.

5. Attach data transport cables – refer to section **4.5**

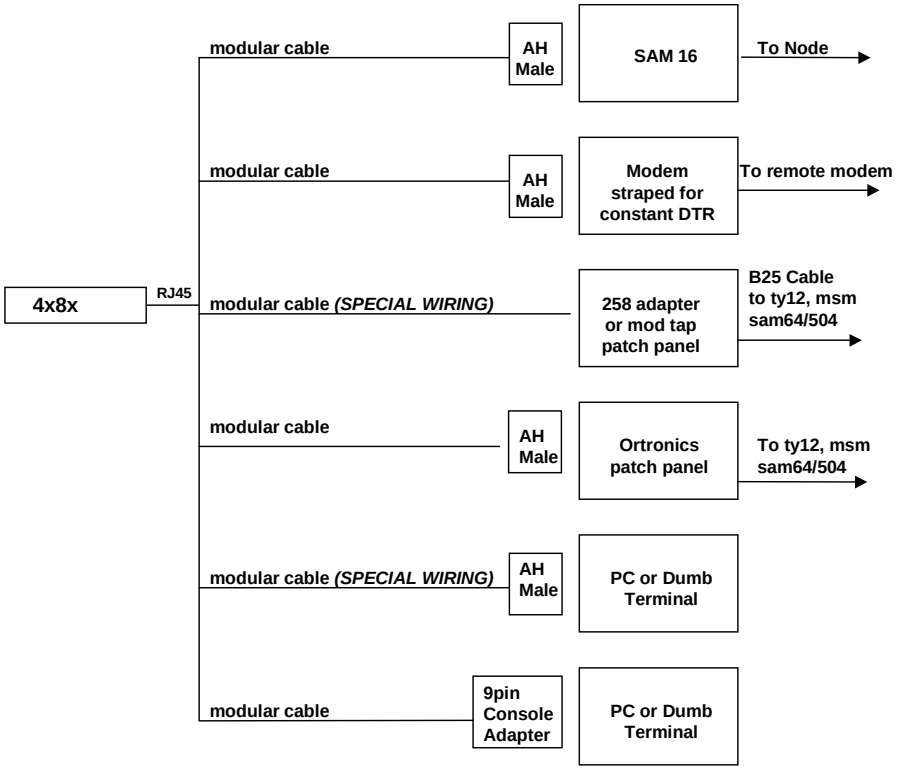
6. Attach console cable by plugging one end of an RJ45-terminated twisted-pair data cable into the unit console interface and the other into the port of the asynchronous device that will be used to configure or manage the unit.

7. Run 48V DC (return, -48, and ground) wires from a central source through the strain relief clamp for DC wire stabilization. On the faceplate, attach the return, -48, and ground wires to the return, -48, and ground connections, respectively, on the terminal block labeled 48V DC.

8. Rack-Mount: The Environmental Operating Range of 5 to 40 degrees C (41 to 124 degrees F) is necessary to maintain compliance with UL.

4.4 CABLING THE 4000XA, 4180, 4280, 4284 CONSOLE

This section describes the options for cabling the **4xxx** console port, to allow the **4xxx** to be managed by a terminal, PC, dial-up modem, or asynchronous network connection. The following diagram shows the connection options:



Important! A modular cable with "SPECIAL WIRING" can be ordered using the table below or built using the wiring diagrams provided in this manual.

- Configure SAM, TY12 and MSM console connections as 9600 bps with 8 bits and no parity, and use a DCE type cable.
- Configure SAM and MSM console connections as type "host" and as a "pap" (permanently active port).
- Configure TY12 console connections as type "console".

Additional instructions for configuration of SAM, TY12 or MSM asynchronous ports may be found in the appropriate BNS module reference guide.

The following cables and adapters are available for console connections:

Cable or Adapter	Order Information (Lucent)	Order Information (Reseller)

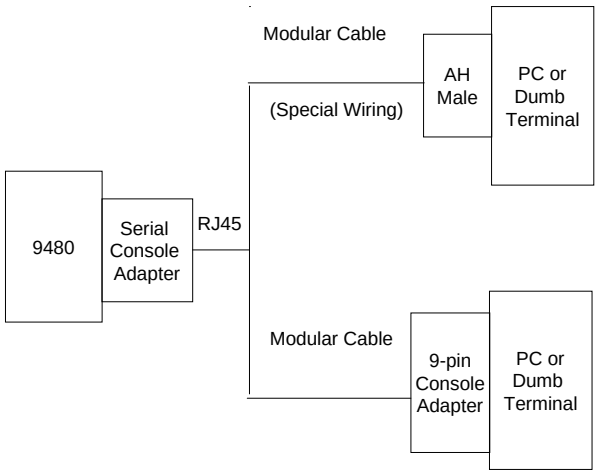
modular cable (10')	407981646	modular cable (length)
modular cable **(special wiring)**	408198133	modular cable **(special wiring)**
AH male connector	ED5P055-31 G-139	AH male connector
Ortronics Patch Panel	406485755	Ortronics Patch Panel
258 Adapter	ED5P055-31 G(155)	258 Adapter

4.5 9480 INITIAL CONFIGURATION CONSOLE CABLING

The serial console is needed to initially configure the **9480**'s IP parameters. These are limited to the IP address, the Gateway address, and IP Network Submask.

Otherwise, the serial console is normally disconnected during normal operation, and *telnet* console access via TCP port 1023 is used. The **9480** does not preclude a serial console connection during normal operation. Should such be desired, a "Y" cable is needed on the DB25 implementing the console connection.

The **9480** serial console configuration wiring options are as follows:



9480 Serial Console Options

The **9480** has no RJ45 jack, like other TeleComp R&D Migration Products, for connection of a serial console. Before connection to the Network Element, a DB25 to RJ45 adapter with special wiring must be attached to the **9480**. The serial console is connected via this adapter and cabling as shown in the figure above. Specific wiring information is found in the cabling section of this document.

The serial console is configured as 9600 baud, 8 bits, and no parity.

4.6 DATA TRANSPORT CABLING – SAM16 REPLACEMENT

This section describes the procedures for cabling a unit being used to replace a SAM16. Existing SAM16 cabling will be reused. The unit will interface to an IP infrastructure and not a BNS trunk. BNS connectivity shall be via a Universal Mediation Interface (UMI) module. Please consult the UMI documentation for more information.

For a completely new installation, this section should still be read first. Differences will be noted in section **4.6**.

4.6.1 Asynchronous User Port Connections

The **4000XA, 4180**, **4280**, and **4284** each have RS-232C *(RJ45)* connectors presented as data terminal equipment (DTE) interfaces, in place of the DB25 connectors on the SAM16. These RJ45 connectors use the same pinouts that each port on a **4000**, SAM64, or SAM504 uses. The following steps are needed for each asynchronous user port to complete the SAM16 replacement:

- **DTE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Attach a **D8AG-F** *(25-pin-F to mod socket, null modem wiring)* adapter to the DB25 cable.
  3. Connect a **D8W** *(mod plug to mod plug, straight through)* cable from the **D8AG-F** to the corresponding **xxxx** RS-232C user port.
- **DCE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Remove the existing DCE to DCE adapter.
  3. Attach a **D8AH-F** *(25-pin-F to mod socket, straight through)* adapter to the DB25 cable.
  4. Connect a **D8W** *(mod plug to mod plug, straight through)* cable from the **D8AH-F** to the corresponding **xxxx** RS-232C user port.

4.6.2 Synchronous User Port Connections

The following steps are needed for each synchronous user port to complete the SAM16 replacement:

- **DTE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Attach a **SYNC DCE-F** *(25-pin-F to mod socket)* adapter to the DB25 cable.
  3. Connect a **D8W** *(mod plug to mod plug, straight through)* cable from **the SYNC DCE-F** adapter to the corresponding **xxxx** RS-232C user port.
- **DCE DEVICE**
  1. Remove the existing DB25 cable from the SAM16 port.
  2. Remove the existing DCE to DCE adapter.
  3. Attach a **SYNC DTE-F** *(25-pin-F to mod socket)* adapter to the DB25 cable.
  4. Connect a **D8W** *(mod plug to mod plug, straight through*) cable from the **SYNC DTE-F** adapter to the corresponding **xxxx** RS-232C user port.

4.7 DATA TRANSPORT CABLING

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4.7.1 User Ports

Although the **4000XA**, **4180**, **4280**, and **4284** are each configured to work like a SAM16, the pin outs on the RJ45 connectors used for the RS-232 user ports are identical to the pin outs for the SAM64 and SAM504 user ports. Thus, all adapters and cables used with these SAM types will apply to the unit. Refer to the Cabling section of *Data Networking Products Synchronous/Asynchronous Multiplexer Reference.* In most cases, a standard RJ45-terminated Category 5 twisted-pair data cable can be used, with the appropriate adapter (depending on the gender) on the connector on the endpoint device.

4.8 Ordering Information

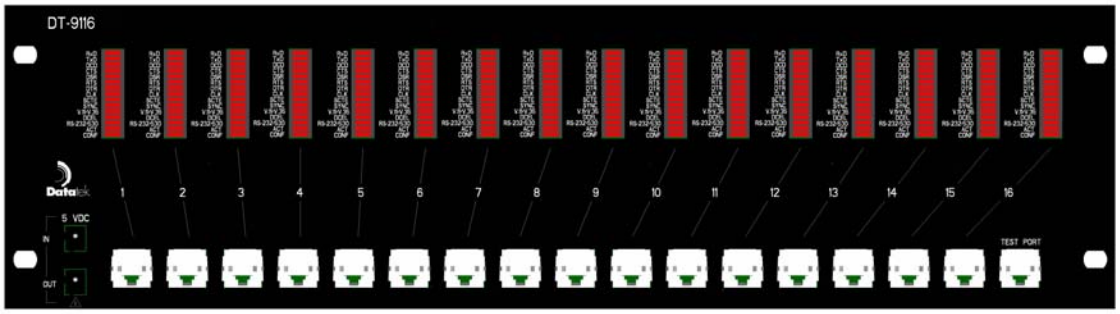
Cable or Adapter	Description	Order Information (Lucent)	Order Information (Reseller)
V.35(M) to DB25(F)	34-pin-M 25-pin-F	408418911	V.35(M) to DB25(F)
D8AG-F	25-pin-F mod socket, null modem wiring	ED5P055-31 G-138	D8AG-F
D8AH-F	25-pin-F mod socket	ED5P055-31 G-147	D8AH-F
D8W	Mod plug Mod plug, straight through, 3ft.	408421803	D8W
SYNC DCE-F	25-pin-F mod socket	ED5P055-31 G-150	SYNC DCE-F
SYNC DTE-F	25-pin-F mod socket	ED5P055-31 G-151	SYNC DTE-F

4.9 THE 9116 INTELLIGENT PATCH PANEL

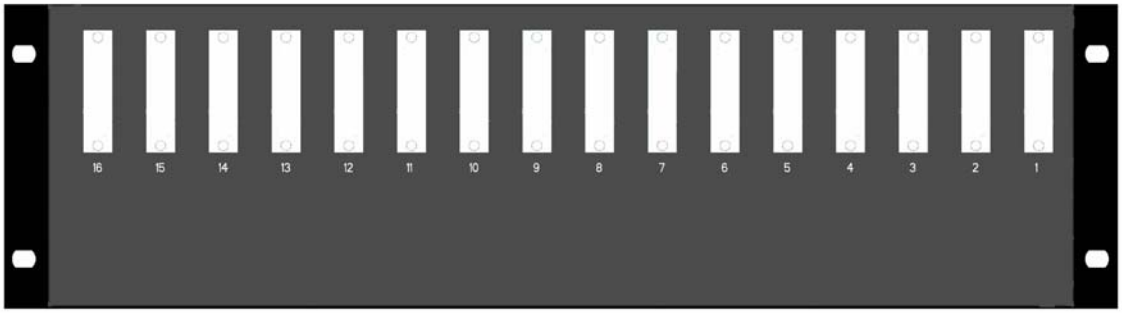
The **9116** Intelligent Patch Panel (IPP) is used to provide software selectable physical interfaces to the **4180** or **4280** user ports. The **9116** supports RS-232, V.35, V.11, RS-530, RS-530A, X.21, RS-422, RS-449, and V.36 interfaces. The **9116** can operate as a DTE or a DCE on a per port basis.

The following is a diagram of the **9116** IPP:

9116 IPP Front View



9116 IPP Rear View



Please note that the **9116** does not have switches of any kind. All configuration information is dynamically set by the **4000XA**, **4180** or **4280**. The DB25 interfaces are on the rear side of the panel, and the RJ45 interfaces and LED indicators are on the front side.

The **9116** IPP is connected to the **4000XA**, **4180** or **4280** on a port by port basis using a short RJ45 to RJ45 straight cable. There is no requirement to connect all of the **4000XA**, **4180** or **4280** ports to the **9116** IPP. Each port will operate independently.

The **9116** requires a +5V power input, and will also cascade the power to the next device. The +5V to the **9116** may be parasite power from the **4280** +5V output connector. In the alternative, a separate AC adapter may be used for the **9116**.

The **9116** DB25 ports are configured with the physical interface selected on the **4000XA**, **4180** or **4280** user console. The ports may operate in DTE or DCE modes. The DB25 is a female and is a native physical DCE. For physical DTE operation, a wiring adapter (or cable) is required. The logical DTE operation is incorporated automatically by the **9116** IPP.

This physical DTE-DTE wiring is as follows:

Signal	DB25 Male (J1) 9116 End.	DB25 Male (J2) DCE Device End.
GND	1	1
SGND	7	7
TxD	2	3
	14	16
RxD	3	2
	16	14
RTS	4	5
	19	13
CTS	5	4
	13	19
DCD	8	20
	10	23
DTR	20	8
	23	10
SCTE	24	17 (also Connect to J2 – 24)
	11	9 (also Connect to J2-11)

Each **9116** port has 15 LED indicators. These are described as follows:

Lamp	Function
RxD	DB25 Receive Data indication.
TxD	DB25 Transmit Data indication.
DCD	DB25 Data Carrier Detect indication.
CTS	DB25 Clear to Send indication.
DSR	DB25 Data Set Ready indication.
RTS	DB25 Request to Send indication.
DTR	DB25 Data Terminal Ready indication.
CLK	DB25 RxC and TxC indication.
SCTE	DB25 External Timing indication.
SYNC	Port is operating in synchronous mode. Asynchronous mode when not illuminated.
DCE	Port is operating in logical DCE mode. Logical DTE mode selected when not illuminated.
V.11/V.35	Port is operating in V.11 or V.35 mode. RS-232 mode when both V.11/V.35 and RS-530(A) lamps are extinguished.
RS-530(A)	Port is operating in RS-530 or RS-530(A) modes. RS-232 mode when both V.11/V.35 and RS-530(A) lamps are extinguished.
Status	9116 IPP port reporting status information to the xxxx.
Configure	The **xxxx** is actively configuring the 9116 port.

The **9116** is also available in a single port version called the **9116-S**. This is shown below.

The single port version of **9116** has all of the features and automatic configuration but no LED displays. The convenient size requires no rack space and converts the RJ45 to DB25 directly. If a Winchester-34 cable is required, a Black Box FA058 or FA059 DB25 to Winchester-34 adapter is attached to the **9116**.

4.10 The 9008 RS-530/V.35/RS-422/V.11 Adapter

The **9008** series of adapters are used to provide balanced physical interfaces to the **4000XA, 4180**, **4280**, and **4284** user ports.

The **9008** supports V.35, V.11, RS-422, and RS-530 interfaces.

The **9008** is available is DCE and DTE variants. It uses an industry standard RJ45 to connect to the **4180**, **4280** and **4284**. It provides an industry standard RS-530 DB25 interface for the balanced physical interface. For legacy interfaces that require a Winchester 34 connection, the Black Box FA059 (DTE), and FA058 (DCE) wiring adapters may be used.

The picture below depicts a 9008-DTE with the Black Box FA059 Winchester 34 pin adapter.

4.11 9001 Discrete Telemetry Adapter

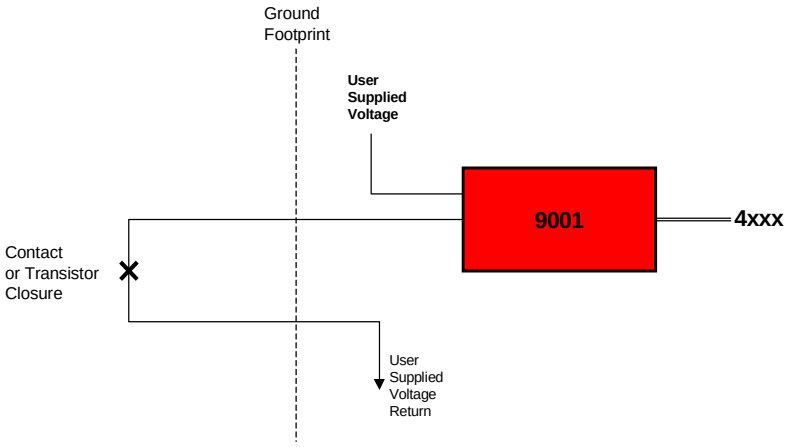
The **9001** adapter provides an inexpensive telemetry interface for 16 discrete elements. It is used in conjunction with an application such as **VTELRMT** implementing a virtual E2A remote; or with the **ONSITE** application for general purpose telemetry. The applications are instances on a **6xxx** embedded network processor.

The **9001** appears as follows:

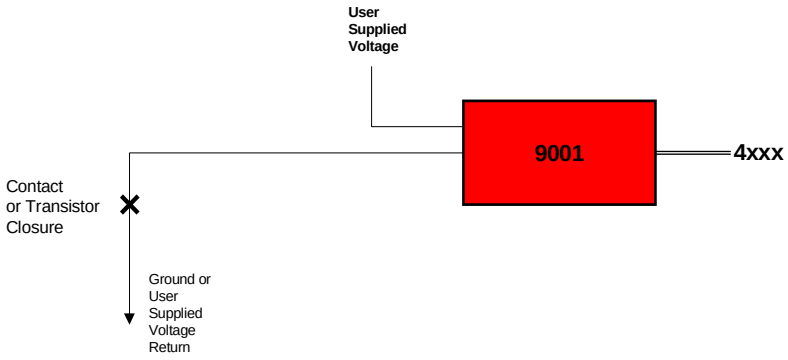
The **9001** provides the following features:

Each SCAN point is optically isolated from the **xxxx** to which it is attached.
Each SCAN point is optically isolated from the **9001**.
Each SCAN point is optically isolated from all other SCAN points.
The **9001** does not require external power for operation.
The **9001** minimizes and simplifies telemetry wiring.
The **9001** does not require any rack space and each supports 16 isolated scan points.
The **9001** reports the rack ambient temperature.
The **9001** may be attached to the **9480** or any **4xxx** serial port.
The **9001** is the lowest cost telemetry solution.

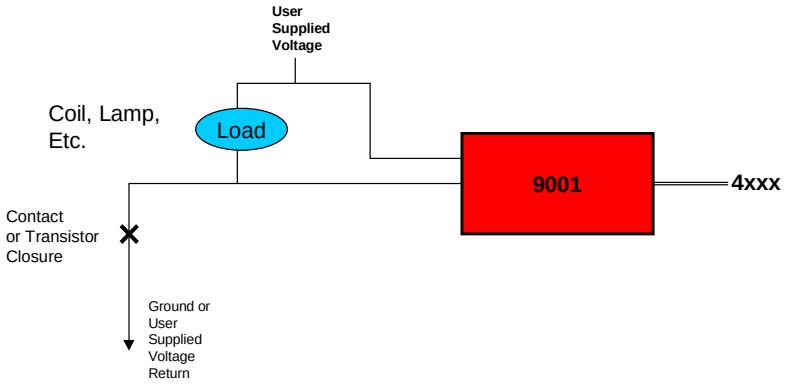
The diagrams below are per the “Network Terminal Equipment Operations Interface Specifications (TR 43904).



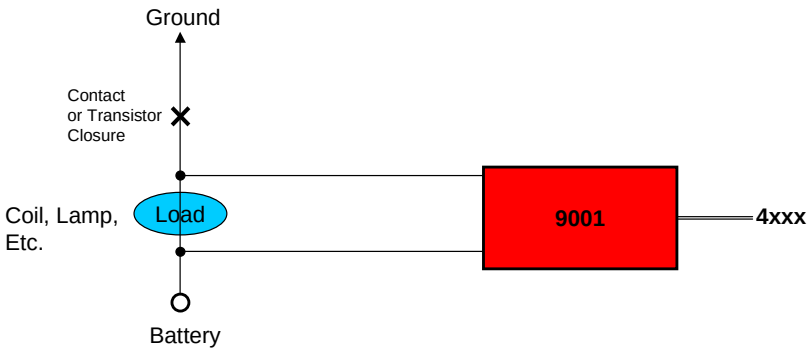
SS Type 1 - Isolated Loop Closure Inside Building



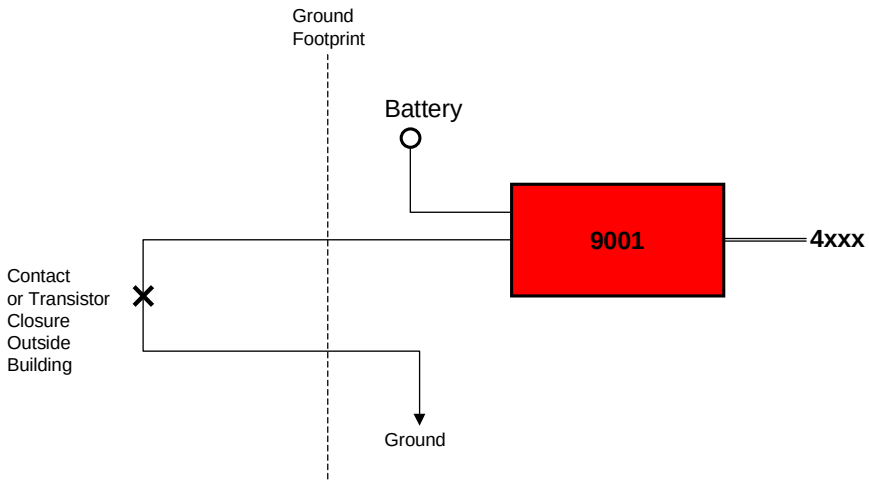
SS Type 2 - Isolated Closure to Ground



SS Type 3 - Isolated Closure to Ground with Load



PS Type 1 - Inputs Requiring Battery and Ground Isolation
(Note: TR43804 External Resistor is not required)



PS Type 2 - Isolated Loop Closure Outside Building
(Note: TR43804 External Resistor not required.)

As can be seen from the diagrams above, the **9001** in conjunction with the VTELRMT application can replace an E2A Telemetry device for discrete scan points.

4.12 Field Upgrade and Software Registration

The unit**,** when initially delivered, will need one or more software keys to activate the software. Software keys are also required when an optional individual feature packages are added to the device. Finally, when the unit is upgraded with revised software, one or more software keys are required to register the installed software and any feature packages registered for the device.

When performing an upgrade, the revised software is initially downloaded by **upgrade**[3] into a staging area and is not active. The software then is activated by a ***reboot***. The new software will execute normally prior to registration. However, no backup, reloads, or upgrades can be performed. Module level parameters, such as the device IP address, may be changed and activated. If a user port is taken out of service, the port cannot be restored.

The procedure for performing a software registration has been mechanized. Manual procedures are error prone and not recommended. They are no longer covered in this user manual.

The mechanized Software Upgrade Registration procedure allows simplified administration of one or more devices. When a quantity of devices are upgraded, manual software registration of each device has the potential of becoming increasingly tedious. The mechanized software upgrade registration process was designed to alleviate the problems associated with multiple device upgrades. It is also preferred for single device upgrades as it eliminates any potential for error.

The new software is downloaded to the unit via the **upgrade** command. This may be performed for one or more devices. The "-r" option to the dtupgrade command will restart the device on the new software after the download completes successfully. It is highly recommended. In the alternative, the device may be downloaded without a restart and restarted at a later time during a scheduled maintenance window. Restarting the device on the new software prior to registration is required. After the restart, the devices will continue to operate normally on the new software without registration. Some operations interface functions are inhibited pending software registration. Below is an example of a typical **upgrade** invocation. Note the use of the "-r" option as it is recommended.

upgrade –v –d –r –i –m9480 10.0.1.80 dt_94xx.4.2

Mechanized registration is performed in three steps. Each of which does not require user intervention.

The steps are as follows:

[3] Utilities may be renamed to any other name. The names shown are those on the distribution.

1. The **getinfo** utility is invoked on a file containing a list of devices to be administered. This file is called the master device list file and is typically named “device.master”. The master device list file may have any name and it is provided as an argument to the **getinfo** utility. The master device list may also contain devices that do not require registration. The **getinfo** utility makes inquiry of each device in the master device list and creates a device information file named “dt_device.info” in the current directory.
2. The “dt_device.info” file is then sent via email to keys@trdcusa.com for registration processing.
3. A file name “dt_device.register” file is returned via email to be used as input in the next step. A file named “dt_device.msgs” is a text file that may be displayed or printed showing the results of the registration function.
4. The **setreg** utility is invoked and uses the “dt_device.register” file provided as an argument. If no argument is provided, the file is assumed to be in the current directory. The **setreg** utility contacts each device that requires registration and have been assigned keys. One or more keys are installed during the dialogue.
5. The “dt_device.info” file and the “dt_device.register” file are deleted as they are transient and have no further value. Neither can be reused for the purpose of registration. However, the dt_device.info file may be used for inventory reports..

The source for the registration procedure is the inventory master device list file that is created, and maintained, by the administrator using their favorite text editor.

The master device list file contains one IP address per line, with an optional TCP port, and an optional password override, to access the device. The IP address is the console *connection address*, and not necessarily the actual device IP address. Registration via the serial console is explicitly supported. Comments are allowed between addresses, and after addresses. A password override is only required if the default password of “initial” has been changed.

The master device file line format is as follows:

<IP ADDRESS> [<TCP PORT>] [-P<Password>] # Comment

An example “device.master” file follows:

```
# This is a Sample master device list file “device.master”.
# Note that there is one device ( Connect IP Address ) per line.
# TCP Port Override is allowed. Registration may use the serial console.
# Password Override is allowed.
# It is OK to have devices that do not need registration listed for inventory.
# Comments in this file are preceded with a pound symbol.
# Blank Lines are treated as comments.
# Basic Line Format is as follows:
10.0.1.80 # Device at Location ‘A’
192.168.7.82 # Device at Location ‘B’
```

192.168.7.155 50001 # Example of TCP port Override.
192.168.7.156 50001 –pcustom1 # Example of Password Override.

Once the “device.master” file is prepared, it is used as an input to the **getinfo** utility.

getinfo dt_device.master

This **getinfo** utility will collect information on each device in the master file. The **getinfo** utility will also make a determination if a registration is actually required. Consequently, the **getinfo** utility is also useful in performing inventory functions outside of the device registration. The output of the **getinfo** utility is a file named “dt_device.info” that is always created in the current directory.

The file “dt_device.info” is attached to an email and sent to the address keys@trdcusa.com. The registration procedure is performed and a file named “dt_device.register” is attached to return email to the original sender. A messages file named “dt_device.msgs” is also attached and may be printed as a report of the key generation function.

After receiving the “dt_device.register” file, the **setreg** utility is invoked with the relative path of the “dt_device.register” file as it’s sole argument. The **setreg** utility will only contact the devices that actually need registration, and for which one or more keys were successfully generated. All of the appropriate keys, including a device key and multiple per port feature package keys, are installed by the **setreg** utility. The device is not restarted and this operation may occur during normal transport operation.

A report utility **devrep** is available. The **devrep** utility uses the “dt_device.info” file to display the inventory information. The usage is as follows:

devrep [-v] dt_device.info

If the file is not specified, the **devrep** utility attempts to use the “dt_device.info” file resident in the current directory.

5 CONFIGURATION

5.1 OVERVIEW

The overall configuration process can be divided into three phases:
Base Configuration – setting up the unit for IP network connectivity, console security, and other general maintenance operations such as displaying measurements and exception logs

User Port Configuration – setting up the unit to enable connections to be established between specific user ports and endpoints on IP networks, performing measurements and diagnostics on user ports

IP-GATE port configuration, if required on the **4000XA**, **or 4180**.

TSR port and timeslot configuration, if required on the **4000XA**, **or 4180**.

Actual command sequences will be presented throughout this section to illustrate the configuration process. Section 6 of this document should be used as the reference for console commands.

5.2 BASE CONFIGURATION

For IP networking, it is necessary to configure the IP address and subnet mask, the IP address of the gateway router, the IP address of an SNMP manager (optional), and the IP address of a domain name server (optional).

To illustrate an IP networking configuration, the following is a command sequence for a basic installation.

```
<4280> login passwd=initial ↵
<4280> local ipaddr=135.17.59.165 submask=255.255.255.0 ↵
<4280> gateway ipaddr=135.17.59.1 ↵
<4280> restore mod ↵
```

5.2.1 Console Security

Console-security parameters, i.e., an administrative login password and the (optional) timeout for automatic console logoff, will also be set up at this time.

5.3 USER PORT CONFIGURATION

5.3.1 IP Originating Ports

User ports designated as ***originating***, using the **port** command, are used to establish connections ***to*** endpoints on the IP network**.** A predefined destination (PDD), in the form of a destination IP address and TCP port number, is required for a user port configured for a synchronous protocol. A PDD is optional for an asynchronous port.

For asynchronous ports, operation from the perspective of a user is determined by whether or not a PDD has been specified. An ***originating*** user port which has a PDD associated with it will have that connection automatically established when the user device goes "off hook", i.e., signals DTR, or when the user sends the attention sequence. If no PDD has been specified, the calling user is instead greeted with a **xxxx Destination>** prompt where **xxxx** is the actual product number. The user would then enter the destination IP address plus TCP port number desired. If no TCP port number is entered, the telnet default (23) is used. The user also has the option to enter a mnemonic host name previously administered into the unit's host table. The session is terminated when the calling user types the attention sequence.

If a Domain Name Server has been defined on the unit, the calling user may also enter a fully qualified destination name *(e.g. "server.ab.company.com")* to be resolved. It is also possible to override the TCP port while still resolving the IP address. For example, the dial string "server.ab.company.com 50030" selects TCP port 50030 and then asks DNS to resolve "server.ab.company.com" to an IP address.

An ***originating*** port optioned for one of the supported synchronous protocols should be configured as a permanently active port (PAP), and also have a PDD specified. This will cause the desired connection to be established as soon as the port is restored to service.

The following example command sequence would set up an ***originating*** user port that would allow the connected endpoint to "dial" other endpoints in the IP network. It will be configured for 9600 baud, 8 bits, no parity, and no PDD defined. It will default to asynchronous operation. Assume the unit is already configured for IP networking, and in service.

```
<4280> port 2 type=orig baud=9600 dbits=8 parity=none ↵
<4280> restore port 2 ↵
```

5.3.2 IP Receive Ports

A unit is accessible from anywhere in the IP network via a single IP address. That is the address administered using the **local** command, as previously shown. At this address, each user port configured as ***receive***, using the **port** command, "listens" on a configured TCP port for the arrival of an incoming call ***from*** somewhere in the IP network. Once a call is established, the telnet over TCP protocol is used for transport. A hunt group may be established, by assigning the same TCP port number to more than one ***receive*** user port. Ports included in a given hunt group do not need to be contiguous.

The following example command sequence would establish a hunt group of ***receive*** user ports to support a modem pool reachable from anywhere in the IP network. Ports #1, #9, and #13 are to be part of the hunt group, at TCP port 51000. They will be configured for 9600 baud, 8 bits, no parity, and permanently active. Assume the **xxxx** itself is already configured for IP networking, and in service.

```
<4280> port 1 type=rcv hport=51000 baud=9600 dbits=8 parity=none
pap=on ↵

<4280> port 9 type=rcv hport=51000 baud=9600 dbits=8 parity=none
pap=on ↵

<4280> port 13 type=rcv hport=51000 baud=9600 dbits=8 parity=none
pap=on ↵

<4280> restore port 1 ↵
<4280> restore port 9 ↵
<4280> restore port 13 ↵
```

5.3.3 IP Closed User Groups

The unit has its own implementation of closed user groups (CUGs) to control access between its user ports and endpoints on the IP network. The **cug** command is used to create a closed user group, as a single IP address or range of addresses in a sub net. The **port** command allows up to 16 CUGs to be associated with a port. Calls in either direction are restricted as follows:

- A call to an IP address from an ***orig***-type user port will be blocked unless the destination IP address belongs to at least one of the CUGs associated with that user port.
- A call to the TCP port number corresponding to a ***receive***-type user port will be blocked unless the calling IP address belongs to at least one of the CUGs associated with the port.

Please see the CUG example at the end of this manual for a CUG application example using the **xxxx**.

5.4 4000XA, 4180 IP-GATE PORT CONFIGURATION

A sequence of three commands:

```
ipgate route
ipgate path
ipgate port
```

configures the **IP-GATE** port on the **4000XA**, **or 4180**.

The **ipgate route** command configures the screening and routing table for the **IP-GATE** port, which specifies a set of destination IP address ranges for which packets originating on the LAN segment connected to the **IP-GATE** port should be forwarded or dropped.

The **ipgate path** command defines the physical path to be used for forwarding packets. A path can be thought of as a “private tunnel” through an IP infrastructure, public or private. It is set up to either originate or receive a TCP/IP connection, specified by the combination of an IP address and TCP port number. A path over TCP/IP is also secure, because only one TCP connection is accepted at the specified **IP-GATE** destination (unlike standard host TCP implementations), and this will be set up automatically by the firmware.

The **ipgate port** command specifies the interface configuration of the **IP-GATE** port on the virtual private network formed by the interconnected LANs. It is a basic address and mask so that the interface may be pinged.

6 COMMAND REFERENCE

These commands are used to configure the operation of the **4000XA**, **4180**, **4280**, **4284**, and **9480** devices.
Not all commands are visible all the time. Should the unit be logged out, only the **login** command is visible. The **reboot** command places the unit in the logged-out mode.

- Commands may be entered in upper or lower case.
- Parameters of the form **name=<value>** may use upper or lower case for **name**.
- Case is preserved for values.
- Backspace erases one character.
- Changes are cumulative.

After running a configuration command (especially those with many parameters) it is always a good idea to run the corresponding **verify** command, to check for any defaulted values which may need to be overridden.

6.1 BASE CONFIGURATION COMMANDS

6.1.1 LOGIN

Syntax #1: login passwd=<password> (default password is: initial)

Syntax #2: login

This command is a security command required for accessing the bulk of the command set. It is only available when the user is logged off. The command has two forms, and three modes of operation.

The first syntax example provides legacy compatibility for operations systems that use that form. The password must contain between one and seven alphanumeric characters. The typed password is case sensitive.

In the second example, the password is not provided on the command line. The login command will then prompt for a password. A password given at the prompt will not be echoed. There is a timeout of approximately 30 seconds on the password prompt.

If one or more **TACACS+** RADIUS Servers are defined, the *second* form is used to log into the device. When used, a connection is made to the first available server. Prompts for “Username” and “Password” are requested. These Usernames and Passwords are administered on the **TACACS+** RADIUS server; and not on the device.

6.1.2 LOGOUT

Syntax: logout

This command returns the unit to its logged-out mode, thus preventing unauthorized access.

6.1.3 CHANGE PASSWORD

Syntax: chgpass old=<password> new=<password> confirm=<password>

This command allows the user to change a previously configured password. The old password is the one currently in effect. The new and confirm passwords should be identical. The password must contain between one and seven alphanumeric characters. The typed password is case sensitive. All arguments are required to complete the command.

6.1.4 LOCAL

Syntax: local [ipaddr=<IP address>]
[submask=<submask>]
[tcpunreach=< ICMP | RESET >]
[phy=<AUTO | 10HDX | 100HDX>]

This command sets up IP networking for this unit. The **mac** (address) parameter is a fixed attribute for each unit that is set at the factory. The **ipaddr** parameter is the IP address of this unit. The **submask** parameter is the subnet mask of the LAN segment on which this unit is located, with a default value of 255.255.255.0.

The operation of the unit**,** when it is called to an invalid TCP port, is specified with the **tcpreach=<ICMP | RESET>]** parameter. When set to **ICMP**, the caller is sent an "ICMP Port Unreachable" message. When set to **RESET**, the TCP connection is sent a TCP reset to the initiator.

The **[phy=<AUTO|10HDX|100HDX>]** option allows the selection of the LAN PHY on the **4284** and **9480**. The default operation is the AUTO value that specifies automatic negotiation with the etherswitch. When AUTO is selected, the PHY will negotiate to 10Mbps or 100Mbps as allowed by the etherswitch. At the current time, the operation is always HDX. Fixed rates may be selected. The value of 10HDX specifies a fixed rate of 10Mbps for the PHY connection to the etherswitch. The value of 100HDX specifies a fixed rate of 100Mbpx for the PHY connection to the etherswitch.

6.1.5 GATEWAY

Syntax: gateway ipaddr=<IP address>

This command identifies the IP address of the local gateway router, if any. The gateway router is the first hop packets travel through to reach a remote destination address residing on a different LAN segment.

6.1.6 DOMAIN NAME SERVER

Syntax: dns [ipaddr1=<IP Address>]
[ipaddr2=<IP Address>]
[ipaddr3=<IP Address>]
[name1=<Domain Name>]
[name2=<Domain Name>]
[name3=<Domain Name>]

The **dns** command is only visible when the unit is logged in.

Each **ipaddrX** field is the IP address of a Domain Name Server to be used for mnemonic addresses not defined in the host table. When all are set to 0.0.0.0, the DNS functions

are disabled. The DNS addresses are used in order. If only one address is to be defined, it is required to be **ipaddr1**.

The **name1**, **name2**, and **name3** parameters are domain names. These domain names are appended to a dial string which is not fully specified for DNS purposes. For example, a name “bender.ho.lucent.com” is fully specified, so nothing is appended. A name such as “bender” would need to have a domain appended before the DNS server could resolve it. The unit will append the specified domain names in the order of **name1** through **name3**, and send the resulting strings to the DNS server in succession until the latter is able to perform a resolution.

6.1.7 TACACS+ RADIUS Servers

Syntax: tac < PRI | SEC > [ipaddr=<IP Address>]
[port=<TCP Port>]
[key=”Encryption Key” | NONE]
[ENABLE]
[DISABLE]

The **tacplus** command is only visible when the unit is logged in. The tac command allows the configuration of up to two **TACACS+** RADIUS servers for the device. the servers are used as a primary server and a secondary server, although they may be individually disabled.

The **< PRI | SEC >** syntax specifies which server is to be configured. A server may not be configured while enabled
The **[ipaddr=<IP Address>]** specifies the IP address of the configured server.
The **[port=<TCP Port>]** specifies the TCP port to use when communicating with the server. The TACACS+ service defaults to TCP port 49, but any port may be specified.
The **[key=”Encryption Key” | NONE]** specifies an encryption key to use. The Encryption key must be enclosed in double quotes, and the double quotes are not part of the key. If no encryption is desired, the value of **NONE** is used to designate unencrypted service.
The **ENABLE** command allows this server to be used for service, and prevents further configuration.
The **DISABLE** command prevents this server from being used for service, and subsequently allows configuration.

6.1.8 HELP

Syntax: help

This command produces a display of the entire command set and syntax available for the mode (logged out or logged in) the unit is currently in.

6.1.9 VERSION

Syntax: ver

This command displays the current software and database revisions of the unit and is only visible when the user is logged in. The **ver** command also displays the authorization level of the user currently logged into the administrative console. The command has no arguments. If new software has been downloaded and no reboot has been performed; the new software version is also displayed.

6.1.10 REBOOT

Syntax: reboot [newip=<New IP Address>]
[newmask=<New Network Mask>]
[newgate=<New Gateway Address>]

This command resets the unit, which allows configured physical attributes to take effect. The command is only visible if the user is logged in. The command has optional arguments to allow the remote alteration of the network configuration. If any network configuration change is required, the user is prompted for the password as a verification check before the reboot is actually executed. After the reboot, the console interface returns to the logged-out mode.

The **reboot** command will always prompt for a password for validation purposes even if the administrator is logged at the appropriate level or higher.

6.1.11 REMOVE MODULE

Syntax: remove mod

This command is only visible when the unit is logged in. The command has no additional arguments. The command takes the unit out of service. This command must be performed before any unit-level configuration changes can occur.

The **remove mod** command will always prompt for a password for validation purposes even if the administrator is logged at the appropriate level or higher.

6.1.12 RESTORE MODULE

Syntax: restore mod

This command is only visible when the unit is logged in. The command has no additional arguments. It returns the unit to service. If any physical attribute was changed on the unit, including the MAC address, the unit will be automatically rebooted by this command.

6.1.13 CLEAR

Syntax: clear < meas >

This command is only visible when the unit is logged in. When the argument value is **meas**, the current measurements are all set to zero. No other options are allowed at this time.

6.1.14 DISPLAY MODULE MEASUREMENTS

Syntax: dm mod

This command is only visible when the user is logged in. It displays the current, unit-level measurements in a formatted report on the console (see for an itemization of the unit-level measurements at the end of this manual). **Port** information is not displayed on the unit-level report.

6.1.15 DISPLAY LOG

Syntax: dlog

This command is available only on the **4000XA**, and **4180**, and displays the **IP-GATE** exception logs. The **IP-GATE** exception log provides details about the last 32 errors recorded. Not all errors generate exception entries. These logs may be cleared using the ***clear logs*** command.

6.1.16 VERIFY MODULE

Syntax: vfy mod

This command is only visible when the unit is logged in. The command displays the unit-level configuration in a formatted report on the console.

6.1.17 HOST NAME ADMINISTRATION

Syntax: host <host #>[name=<host name>][ipaddr=<IP address>]
[port=<TCP port>][del]

The units all support mnemonic destination name translation for non-PDD originating user ports. These mnemonic names are translated into an IP address and TCP port during call setup. The **host** command is used to configure the translation table

The **name** field is a mnemonic for a destination up to nine characters in length. The **ipaddr** (of the host) and TCP **port** (on the host) parameters specify the translation to be performed during call setup. If the parameter **del** is used, the entry is deleted.

6.1.18 VERIFY HOST

Syntax: vfy host

This command is only visible when the unit is logged in. It displays host-address configuration in a formatted report on the console.

6.1.19 SNMP

Syntax: snmp [ipaddr= < trap mgr addr >]
[port= < trap mgr port >]
[CUG=<<+|-> CUG Number>]

[PUBLIC=< YES | NO >]
[COMM="Double Quoted String" | NONE]
[SYSCONTACT="Double Quoted String" | NONE]
[SYSNAME="Double Quoted String" | NONE]
[SYSLOC="Double Quoted String" | NONE]

This command is used to configure the IP address of the SNMP trap manager. Since traps are unsolicited alarms, an agent can take the initiative to inform the manager of the occurrence of a predefined condition. Typical conditions include the cold-start or warm-start of equipment and a link-down or link-up condition.
A single and multiple SNMP managers can access the unit. However, only one SNMP manager can be defined as the trap manager. As a result of this command, all traps will be directed to the chosen trap manager.

The **ipaddr** field defines the IP address of the SNMP manager to which the traps are to be sent.
The **port** field indicates the UDP port on that SNMP manager and defaults to the standard value of 162.

Any combination of closed user group membership may be assigned to the SNMP interface using the parameter of **cug=[+|-]<CUG Number>**. The closed user group membership is displayed on the "verify module" output. Packets which have failed the SNMP Closed User Group Test are discarded. An alarm is not presented, but the failure is counted. The number may be displayed with the "dmeas mod" command.

The unit allows setting of an SNMP community in addition to the *public* community. The *public* community is recognized when the **[PUBLIC=YES]** option is selected. Recognition of the public community is the default operation. When **[PUBLIC=NO]** is selected, the *public* community is not recognized.

The **xxxx** allows setting of an SNMP community in addition to the *public* community. When configured, the **xxxx** will respond to SNMP manager requests in that community. The **xxxx** will always respond to a request in the *public* community. The settable SNMP community is configured with the **[COMM="Double Quoted String" | NONE]** option. The community may be in any case. The double quote encapsulation is not part of the community string. The settable community may be cleared by setting it to the keyword **NONE**.

The MIB-II variables sysName, sysContact, and sysLocation may be initialized from the **xxxx** non-volatile database using the **SNMP** command. These variables are volatile in that they may be over-written by an SNMP manager. However, any change made by the SNMP manager will not impact the **xxxx** non-volatile database. Setting the value to **NONE** will clear the entries in the **xxxx** non-volatile database. Each field may be of 31 characters or less. The double quote encapsulation is not part of the respective variable. Any of the variables may be cleared by setting it to the keyword **NONE**.

6.1.20 INSTALL (Software Registration)

Syntax: install [key=<software key>]
[fpkey=<software key>]

The **xxxx** has a unique device software key, and multiple per port feature package keys. This section is included in the user manual for completeness. Under normal circumstances, only the mechanized utilities utilize this command. It may be executed manually under an emergency situation. Depending on the device, the keys may or may not be installed by the factory. The per port feature package keys my be added at any time, and do not affect the operation of the unit. The registration procedure does not require a restart to take effect on a device running the registered software.

When executed without arguments, the **install** command will display the significant information needed to manufacture the device software key. The device IP address may also be required. No additional information is needed to create the feature package keys.

The **key=<software key>** argument allows the entry of an eight-character alphanumeric software registration that is unique to this **xxxx** device. If an invalid key is entered, a MINOR alarm is generated to that effect. The passwords are not altered. The **rstpass** command has been created to reset the passwords should that become necessary.

The **fpkey=<software key>** argument allows the entry of an eight-character alphanumeric software registration that is unique to a port, and software feature package, on this **xxxx** device for the current software build. The specific feature package referenced by the software key becomes immediately available on the port without subsequent download. The <software key> has effect on only one port. Other ports on the device are not affected. If the same software feature package is needed on multiple ports, then multiple feature package keys are applied.

The **install** command is always available.

6.1.21 RSTPASS (Resetting the Password)

Syntax: rstpass [key=<Password Key>]

The **rstpass** command is a command whose function is to reset the password(s) of the device to factory default values. This function was formerly performed as part of the software registration. Breaking it out into a separate command allows the software to be registered without password updates to take place.

When invoked without arguments, the **rstpass** command will display the relevant information needed to generate the **<Password Key>**. This information is relayed to the technical support staff. The generated key is then used with the **key=<Password Key>** argument. The **rstpass** command should not be run between the time the key data is generated and the **<Password Key>** is utilized. Similarly, if the device is restarted, the resultant **<Password Key>** will not perform its intended function.

6.1.22 CONSOLE TIMEOUT

Syntax: timeout [off | < number of minutes >]

The **xxxx** console uses a three-wire interface (RD, TD, GND), and the lead state of other signals is not relevant. This would imply that the only way to change the state of the console is to explicitly log in or log out or via a reboot or reset, which forces the console to be logged out.

For users who wish the console to automatically log off after a period of inactivity, there is a console timer. The console timer defaults to the disabled condition, and may be activated by the **timeout** command. This command is only visible when the console is logged in. The **<number of minutes>** value must be between 1 and 255, inclusive. When the **xxxx** determines a period of inactivity of the specified time, it automatically forces the console to log off. An **INFO**-level alarm is issued at that time.

6.1.23 Label

Syntax: label ["Double Quoted String" | none]

The **label** command is used to give the command console a unique prompt. The command is visible only when logged into the **xxxx** administrative console. If the **label** command is invoked without arguments, the current configuration of the label is displayed. If the argument to the **label** command is the word 'none', any current label is set to a null value. If the argument to the **label** command is a double quoted string, the contents of the string becomes the application console prompt label. A console label may be up to 31 characters in length.

6.1.24 PING

ping <IP address> [Interval Seconds]

The **ping** command is only visible when the unit is logged in. The command has a single required argument, the IP address that is to be pinged.

The **ping** command formats an ICMP echo request packet which is then sent to the IP Address specified. The device with that address will issue an ICMP echo reply to the request. This is required of all IP implementations by RFC 791. If a reply is received, an informational alarm is issued on the UMI console. If no reply is received, there is a timeout message that will appear for that ICMP echo request.

The ping command issues a single ICMP echo request packet and awaits a response. The response is printed, and another ICMP echo request is issued. The operation continues until the user presses *any* character. The **[Interval Seconds]** argument specifies the amount of time to wait in seconds between the individual ICMP echo requests.

It should be noted that some host Internet Protocol implementations issue duplicate responses to a single ICMP request. The **ping** command will suppress duplicate replies.

6.1.25 TraceRoute

trte <IP address>

The **trte** command is only visible when the unit is logged in. The command has a single required argument, the IP address that is to be pinged.

The **trte** command formats an ICMP echo request packet that is then sent to the IP Address specified. The valid packet "time to live" is set to an initial value of "1". If the IP address is on the local subnet, the ICMP echo will respond immediately. If the IP address is on a different subnet, the gateway router will decrement the "time to live" upon routing the packet. When the "time to live" reaches zero, the gateway sends an ICMP "time exceeded" message to the **xxxx**. The **xxxx** then displays the gateway device, and increments the "time to live" on the next ICMP echo request packet. This continues until the IP address is reached. The result is a display of all the intermediary gateway devices used to reach the IP address from the **xxxx**.

If no answer is received, each "time to live" value is tried 3 times before an increment. The timeout is 5 seconds for each attempt. The maximum number of "time to live" is set to 30 in this build of the **xxxx**.

Since a traceroute command can be unusually long in duration, any character sent to the console will interrupt the operation of the traceroute command.

6.1.26 TSR CONFIGURATION

Syntax: TSR [frmr = < e1 | t1 >]
[prof = < t1 waveform >]
[timing = < int | net >]
chan=<Channel #> [addslot = <all | slot_no>]
[delslot = <all | slot_no>]
[tsrate=<64|56|48|40|32|24|16|8>]
[type=< ORIG | RCV >]
[codec=< HDLC | TRANS >]
[dest=<IP Address> dport=<TCP Port>]
[hport=<Hunt Group TCP Port Number>]
[crc=< 16 | 32 >]

This command configures the RJ48C Time Slot Router interface on the **4000XA** and **4180**. The TSR supports channels that contain one or more timeslots. There are 24 channels available for a T1 connection to the TSR, and 32 channels available for an E1 connection to the TSR. Each channel is independent, and may be used for HDLC based data or for bit-independent data such as voice. When HDLC based data is specified, the HDLC protocol is terminated on the **4000XA/4180** and only user traffic traverses the IP network. The network protocol for HDLC TSR channels is TCP, and is compatible with ***6xxx*** based applications. When transparent based data is specified, the **4000XA/4180**

uses the IP “real time protocol (RTP)” for delivery in an expedient manner without under-run or over-run. The TSR may be configured in one or multiple instances of the same command (changes are cumulative).

The **frmr** parameter indicates what basic framing is being used. A value of **T1** is used for domestic 1.544 MHz interfaces with 193 Bit Superframes. A value of **E1** is used for European interfaces at 2.048 MHz with 256 Bit Superframes.

The **prof** parameter indicates the Transmission Waveform to be used with T1 transport. There is only one E1 transport profile, which is automatically set. The following table indicates the available waveforms for T1.

Option	Description
0DB	T1 Long Haul w/ 0 DB Attenuation.
7DB	T1 Long Haul w/ 7.5 DB Attenuation.
15DB	T1 Long Haul w/ 15 DB Attenuation.
22DB	T1 Long Haul w/ 22 DB Attenuation.
S0	T1 Short Haul @ 0-110 Feet.
S110	T1 Short Haul @ 110-220 Feet.
S220	T1 Short Haul @ 220-330 Feet.
S330	T1 Short Haul @ 330-440 Feet.
S440	T1 Short Haul @ 440-550 Feet.
S550	T1 Short Haul @ 550-660 Feet.
T0	TR62411 T1 Long Haul w/ 0 DB Attenuation.
TS0	TR62411 T1 Short Haul @ 0-110 Feet.
TS110	TR62411 T1 Short Haul @ 110-220 Feet.
TS220	TR62411 T1 Short Haul @ 220-330 Feet.
TS330	TR62411 T1 Short Haul @ 330-440 Feet.
TS440	TR62411 T1 Short Haul @ 440-550 Feet.
TS550	TR62411 T1 Short Haul @ 550-660 Feet.

The TR62411 nomenclature indicates compliance to the AT&T TR62411 ACUNET T1.5 pulse template. It is to be used for situations requiring such compliance.
The **timing** parameter indicates the timing signal to be used for transmission. A value of **INT** (internal) indicates that the **4000XA/4180** should generate the transmit clock internally from its precision oscillator. A value of **NET** (network) indicates that the **4000XA**/**4180** should recover the transmit clock from the receive data stream and use it for transmission. It should be noted that there may only be one master clock in the DSU interface between components, and there ***must*** be one master clock in that interface.

The **tsrate** parameter indicates the type of timeslot to be used. This is used for support of time slots which do not operate at the full 64K rate. The most prevalent is a 56K timeslot for DDS and Frame Relay protocols. These sub-rate timeslots may be connected to a remote channel bank to provide for remote HDLC connections.

The **chan** is a modifier specifying the channel number on the TSR for connection information, codec specification, and timeslot assignment. It may take on the value of one through twenty-four for a T1 TSR port, or a value of one through thirty-two for an E1 TSR port.

The **addslot** parameter allows the user to map a single time slot to a channel, or all time slots defined for the TSR type, in the usage map. This allows fractional T1/E1, using from one up to the maximum number of timeslots (24 for T1, 30 for E1). Note that in E1 framing, the first and 16th (17th , counting from one) timeslots are not usable, according to the standard

The **delslot** parameter allows the user to remove a timeslot from the usage map. All of the timeslots may be removed with the **all** option.

The **type** parameter indicates the direction of the connection origination in the TCP/IP network. A type of **orig** indicates that the **4000XA/4180** is to originate a connection to the IP address specified by the **dest** parameter, and TCP port number specified by the **dport** parameter. A type of **rcv** indicates that the **4000XA/4180** is to expect a connection on the hunt group TCP port specified by the **hport** parameter. If not specified, the default hunt group TCP port is 51,000 + the channel number.

The **crc** parameter specifies the type of CRC checking performed by the **4000XA/4180** on TSR channels which are configured as HDLC. A **crc** value of 16 indicates a 16 bit CRC, and a **crc** value of 32 indicates a 32 bit CRC. The normal CRC for HDLC is 16 bits.

6.1.27 DATA-BASE RESET

Syntax: dbreset passwd=<password>

This command returns the **xxxx** to the default configuration set up by the factory. The password will return to the factory default of ***initial***.

The **dbreset** command will always prompt for a password for validation purposes even if the administrator is logged at the appropriate level or higher.

6.1.28 DISCONNECT CONSOLE

Syntax: disc console

The **disc** command is only visible when the unit is logged in. If a telnet console is connected to the **xxxx**, the session is terminated. This is useful in IP networks when the remote peer vanishes due to a remote reboot or a network error.

The **disc** command will always prompt for a password for validation purposes even if the administrator is logged at the appropriate level or higher.

6.1.29 ADMINISTER SECURITY BANNER

Syntax: banner [clear] [L#="Line # Message"]

The **banner** command is only visible when the unit is logged. It is used to administer the security banner. The default is a NULL banner. If a security banner is configured, it is displayed at each user login. The **clear** option is a shortcut to erase the entire message.

6.1.30 CLOSED USER GROUP (CUG) ADMINISTRATION

Syntax: cug < cug num > [ipaddr=< ip address >]
[submask=< ip submask >]

The **cug** command is only visible when the unit is logged in. The **<CUG_num>** parameter is the closed user group identifier used to assign the CUG to a user port (with the **port** command), or the console (with the **console** command). The **<CUG_num>** may be a value between 1 and 16, inclusive.

A single IP address and subnet mask pair specifies each CUG. The **ipaddr** parameter is an address of an endpoint (or base address of a group of endpoints) to be allowed into the group. The **ipaddr** value *ANDed* with the **submask** value must agree with the caller's or destination's IP address *ANDed* with the same **submask** for a call to be allowed to or from a user port to which the CUG is assigned. Depending on the **submask** value, this allows an individual (submask=255.255.255.255), intermediate, or network-wide level of authorization.

Setting the **ipaddr** value to 0.0.0.0 deletes any prior configuration for the **<CUG_num>**. A **<CUG_num>** may not be deleted if it is currently assigned to any user port.

A list of all configured CUGs is reported via the **vfy cug** command. The list of closed user groups associated with a given user port is presented in response to the **vfy port** command.

6.1.31 VERIFY CUG

Syntax: vfy cug

This command is only visible when the unit is logged in. It displays the configuration of all Closed User Groups.

6.1.32 ASSIGNING A CUG TO THE CONSOLE

Syntax: console cug=<+|->< cug num >

The **console** command is only visible when the unit is logged in. The **<CUG_num>** parameter is the closed user group identifier as defined with the **cug** command. A prefix

of **+** will add the **<CUG_num>** to the list associated with the telnet console. A prefix of **–** will delete the **<CUG_num>** from the list associated with the telnet console.

If the telnet console is connected at the time a closed user group is defined, the connection must be allowed in the closed user group. If the connection is not allowed, an error message is displayed and the association will not take place.

If it is desirable to disable the telnet console entirely, a closed user group consisting only of the **xxxx** address may be assigned to the console. The net effect is to disallow any and all connections via the telnet console.

6.1.33 Administrative Logins & Command Security

```
Syntax: admpass lev=<#> [old=<Existing Password>]
                        new=<New Password>
                        confirm=<New Password>
```

The **xxxx** supports the concept of “Administrative Passwords”. When defined, there are four levels of “Administrative Passwords” in addition to the general user password. The command set is divided among the various levels of administrators. The General User has the least permissions, and a Level 4 administrator has global permissions.

If the administrative passwords are not defined, the general user has global permissions. The level 4 administrative password must be define first. Once the level 4 administrative password is defined, it is required to change any of the administrative passwords.

The **old=<Existing Password>** is not required in the initial setting of the level4 administrative password. It is also not required if the level 4 administrator wishes to change any of the lower level passwords.
Once administrative passwords are set, the **xxxx** command set requires the following authority:

ADMPASS	Level 4 Administrator
BANNER	Level 4 Administrator
CHGPASS	General User
CLEAR	Level 1 Administrator
CONSOLE	Level 3 Administrator
CUG	Level 3 Administrator
DBRESET	Level 4 Administrator
DCACHE	General User
DCONN	General User
DIAG	Level 2 Administrator
DISC	Level 2 Administrator
DLOG	General User
DMEAS	General User
DNS	Level 4 Administrator

DSTAT	General User
GATEWAY	Level 4 Administrator
HELP	General User
HOST	Level 3 Administrator
INSTALL	General User
LABEL	Level 4 Administrator
LOCAL	Level 4 Administrator
LOGOUT	General User
MAP	General User
PING	Level 1 Administrator
PORT	Level 2 Administrator
REBOOT	Level 4 Administrator
REMOVE (mod)	Level 4 Administrator
REMOVE (port)	Level 2 Administrator
REMOVE (IP-GATE)	Level 2 Administrator
REMOVE (TSR)	Level 2 Administrator
RESTORE (mod)	Level 4 Administrator
RESTORE (port)	Level 2 Administrator
RESTORE (IP-GATE)	Level 2 Administrator
RESTORE (TSR)	Level 2 Administrator
RSTPASS	General User
SAMEXT	Level 2 Administrator
SNMP	Level 3 Administrator
SNOOP	General User
TIMEOUT	Level 4 Administrator
TSR	Level 2 Administrator
VER	General User
UPROMPT	Level 3 Administrator
VFY	General User

Please note that if multiple administrators have the same password, the lowest value is used. It is recommended that passwords be unique.

6.1.34 eSAM Board Configuration

The **xxxx** may be configured to operate as a network extended *board* from a **eSAM**. This configuration is used in conjunction with BNS and Datakit networks as a method to provide BNS native mode operation while traversing an IP infrastructure.

The **xxxx** is configured as a **eSAM** extension board with a single command **samext** without arguments. It will prompt for a level 2 password as confirmation to proceed with the configuration. The **samext** command will configure all the ports on the **xxxx** to act as **eSAM** extended ports and restore them to service. The **eSAM** will subsequently make a TCP connection on a per port basis and declare the board inserted when all of the connections have completed. Prior to using the **samext** command, all of the ports on the **xxxx** need to be removed from service.

6.2 USER PORT COMMANDS

The User Port commands are used to configure the operation of the individual RS-232C ports on the **xxxx**. The ports are endpoints on an IP infrastructure. They may be configured to originate or receive connections by the commands in this section. When used with a “built in” X.25 mediation interface, the connectivity configuration is not required.

6.2.1 PORT

Syntax: port < PortNum > [type = <orig | rcv | X25 | E2AHOB | IPDSU | REDHOB>]
[pdd = < PDD DNS destination address >]
[dest = < ipaddr >]
[dport = <tcp port >]
[hport = <tcp port >]
[peer = <IP-DSU Peer IP Address>]
[prot = < protocol >]
[dxe = < dce | dte >]
[clk = < norm | rcvd >]
[phy = < 232 | v35 | 530 >]
[baud = < baud rate >]
[enc = < nrz | nrzi >]
[ccar = < on | off >]
[swcar = <on | off >]
[pap = < on | off >]
[fill = < mark > | < flag >]
[dbits = < 5 | 6 | 7 | 8 >]
[parity = < even | odd | none >]
[stop = < 1 | 1.5 | 2]
[attn = < 1brk | 2brk | none | char >]
[flow = < xon | hw | none >]
[cug = [+ | -] < cug num >]
[crfix = < trans | nonnull >]
[crlf = < trans | nolf >]
[PDDonCR = < on | off >]
[crypt = < on | off >]
[loopback = < OFF | NET | PORT | BOTH >]
[comment = ”user comment”]
[moveto=<New Port Num>]
[copyto=<Port Number Range>]
[x25dxe=< DTE | DCE >]
[x25win=<LAPB Tx Window Size>]
[x25t1=< LAPB T1 Timer >]
[x25n2=< LAPB N2 Retry Counter >]
[x25dar=< ON | OFF >]

[x25pass=< OFF | DFLT | "Password String" >]
[x25xid=< XID Link ID >]
vc=<Range> [vcsvc=< PAD | PASS | ISO
RBP | MAC | SESS>]
[vcckt=< SVC | PVC >]
[vcwin=<VC Tx Window>]
[vcpkt=< 128 | 256 | 512 | 1024 >]
[pvcreset=< ON | OFF >]
[pvcrstlnk=< OFF | CONSTDCD | SWDCD >]
[svctclass=< NONE | Throughput >]
[padecho=< ON | OFF >]
[paderase=< NONE | BS | <Hex Byte>]
[padidle=< #X.3 Ticks >]
[padbreak=< NONE | INTR |
RESET | BRKIND >]
[padparity=< TRANS | EVEN | ODD >]
[padcrlf=<NONE | RMT | VC | BOTH>]
[padfwd=<NONE | CR | CRDROP |
SEMI | ALL | GRPx >]
[padcmap=< ON | OFF >]
[padapi=< RAW | TELNET >]
[PADCUG=[+|-]<CUG Number>]
[calling=< DNIC+NTN >]
[called=< DNIC+NTN >]
[ulen=< UData Length >]
[udata#=< HEX BYTE >]
[ext_calling=< OSI NSAP >]
[ext_called=< OSI NSAP >]
[hport=<VC Hunt Group TCP Port>]
[vccom="User Comment"]

This command configures an individual user port. The **<PortNum>** parameter is a number in the range of 1 through the N that corresponds to the RS-232C user port being configured. The value N is one for the **9480**, four for the **4284**, sixteen for the **4000XA** and **4180**, and thirty-two for the **4280**.

When a port uses TCP/IP for communications, it is either a port which waits for an incoming call (**type=rcv**), or an originator of a call (**type=orig**). The (optional) PDD for an **orig-type** port is defined by **dest=<ipaddr>** and **dport=<tcp_port>**. A caller on an originating port without PDD information configured will be presented a **xxxx Destination>** prompt for "dialing".

A port with (**type=x25**) is internally connected to a corresponding instance of the X25PAD application. One or more of the various X25PAD feature packages is required for this option. The X.25 options then become available for this port. The virtual circuits for the X.25 ports will default to a TCP port number of 30,000 for the 1st port plus the

virtual circuit number (e.g. 30001, 30002, …). Each subsequent X.25 port will add 200 to this value. The second X.25 port begins at 30200, the third at 30400 and so on.

A port with (**type=E2AHOB**) is internally connected to a corresponding instance of the **E2AHOB** application. The **E2AHOB** feature package is required for this option. There is no required configuration of the **E2AHOB** application. The E2A remote connections will be to the TCP port number of 30,000 for the 1st port plus the remote number (e.g. 30001, 30002, …). Each subsequent **E2AHOB** port will add 200 to this value. The second **E2AHOB** port begins at 30200, the third at 30400, and so on. The **E2AHOB** application is available on the **9480**, and the **4284**.

A port with (**type=REDHOB**) is internally connected to a corresponding instance of the **REDHOB** application. The **REDHOB** feature package is required for this option. There is no required configuration of the **REDHOB** application. The REDAC protocol remote connections will be to the TCP port number of 30,000 for the 1st port plus the remote number (e.g. 30001, 30002, …). Each subsequent **REDHOB** port will add 200 to this value. The second **REDHOB** port begins at 30200, the third at 30400, and so on. The **REDHOB** application is available on the **9480**, and the **4284**.

A port with (**type=IPDSU**) is internally connected to a corresponding instance of the **IPDSU** protocol application. The **IPDSU** feature package is required for this option. The **IPDSU** protocol options then become available for this port. **The peer=<IP-DSU Peer IP Address>** option is used to define the remote peer IP-DSU connection for this port. Loopback operations are perfomed with the **loopback=< OFF | NET | PORT | BOTH** > option. The **loopback=NET** implements a loop of remote data back to the remote peer. The **loopback=PORT** implements a local loopback to the port. The **loopback=BOTH** is a union of these two functions. Loopbacks are disabled with **loopback=OFF**.

When the PDD destination information is specified with the **pdd=<DNS destination address>** option, the **xxxx** uses the specified DNS server to resolve the name. A DNS server address must be entered prior to configuration of any of the ports. The **pdd** parameter is mutually exclusive with specifying the IP address directly via the **dest** and **dport** parameters. A value of none (i.e. **pdd=none**) will clear the DNS destination address.

A **rcv-type** user port is assigned a default TCP port number of 50000 + user port number, i.e., 50001 to 50016. The port may then be addressed uniquely at that address. However, when a specific TCP port number is specified via the **hport=<tcp_port>** option, it is used in lieu of the default value. Multiple ports may share the same TCP port number, to define a **hunt group**. When a connection is directed to a TCP port number associated with a **hunt group**, the **xxxx** selects the next available physical port by round robin. The **hport** parameter only applies to **rcv-type** ports.

The **hport** option also operates on virtual circuits to create hunt groups. This operation is selected when the **hport** option is used on an X.25 port. The virtual circuits must be specified. The virtual circuits need not be contiguous, and may span X.25 ports. For example, a 21 virtual circuit hunt group may be created by placing 7 virtual circuits each from three ports into the same TCP port number hunt group.

The **prot=<protocol>** option defines the protocol used by the port. It may take on the values of **Raw, Async, HDLC, SDLC, EBSC** (EBCDIC BiSync), **ABSC** (Ascii BiSync)**, UNI** (Uniscope BiSync), **ALC** (ALC BiSync)**, DDCMP**, **VIP** (VIP 7600 BiSync), **REDAC** (SCADA Telemetry), **E2A** (E-Telemetry), or **DPS** (DPS Specific E-Telemetry). The former name of the E2A protocol (VBA) is no longer supported to avoid any confusion. The **DPS** protocol is supported on the **9480**, and the **4284**. The default protocol is **Async**. The **Raw** protocol is asynchronous, without the benefit of Telnet RFC encapsulation. It is used for direct TCP connections to the user ports. Please send email to the author at angel@trdcusa.com or via telephone @ (386) 754-5700, with any other protocol requests.
Ports with a type of **IPDSU** may also have a protocol type of **SWT**, **SAMWT**, or **DDS** relating to specific BNS trunk modules.

The **dxe=< DCE | DTE >** option specifies the clocking and signaling mode of the port. The default value is DCE.

When the protocol is asynchronous, a **dxe** value of **DCE** implies that the port is operating as a modem device. It will assert CTS when presented with RTS. A value of **DTE** for the asynchronous protocol implies that the port is operating as a 2-wire DTE. When there is data available to send, it will assert RTS and wait for CTS before sending data. Please note that a four wire DTE interface should be configured as **DCE** even though is uses a DTE asynchronous connector.

When the protocol is synchronous (e.g. SDLC*)*, a **dxe** value of **DCE** implies that the **xxxx** should generate the clock signals. This would require the standard synchronous DCE cable adapter. A **dxe** value of **DTE** implies that the **xxxx** should accept the clock signals presented on the port. This would require the standard synchronous DTE cable adapter. When the protocol uses a recovered clock instead of a separate clock lead (e.g. SDLC NRZI two wire), the **dxe** value operates like the asynchronous protocol described above since external clocking is not necessary. The appropriate asynchronous adapters should be used.

The **clk=< NORM | RCVD >** option specifies the location of the clock signal. A value of **NORM** indicates that the clock signals are present on the TxC and RxC leads. This is the normal operating mode for synchronous protocols. A value of **RCVD** indicates that the clock signals are presently encoded in the data stream. This is valid for NRZI and FM encoding of the data stream for any protocol.

The **phy**=<232 | V35 | 530> option specifies the physical interface specification to be used by a **9116** connected to the user port. If a **9116** is not connected, the physical interface is RS-232. The **4280** automatically determines a **9116** connection and performs the dynamic configuration.
The **enc=<NRZ|NRZI>** option specifies the physical encoding of the line. The default is Non-Return to Zero (NRZ).

The **ccar=<ON|OFF>** field defines constant carrier. This is an option in which the CD (or DTR if the port is a DTE) EIA signal is maintained asserted regardless of call status. The constant carrier feature is mutually exclusive with switched carrier.

The **swcar=<ON|OFF>** field defines a switched carrier for the **xxxx** port. This is an option in which the CD EIA signal is switched consistent with two-wire modem operation. It is designed only for DCE operation. That is, CD is active just prior to and during data transmission to the connected device. It is inactive otherwise without regard to the state of the TCP connection. The switched carrier also implies a true “two wire” circuit. The **xxxx** will not send data to the device while the device has been given clearance to send data via the CTS EIA lead. The **xxxx** port will not give clearance via the CTS EIA lead in response to an RTS assertion request while it is sending data with CD asserted. The switched carrier feature is used only with the E2A protocol, and then only for specific devices requiring a true “two wire” functionality. The switched carrier feature is mutually exclusive with the constant carrier feature.

The **pap=<ON|OFF>** field defines a permanently active port. The default value is OFF. Setting this flag ON means that the port is ready to communicate regardless of its DTR (or DCD if the port is a DTE) EIA signal.

The **fill=<mark|flag>** option indicates what kind of line fill should be applied between frames in the **HDLC** or **SDLC** protocols.

The **baud=<baud_rate>** determines the speed of the line. It is not required for synchronous DTE ports since the clocking is derived from the line. For asynchronous ports, the allowed values are 75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 48000, 57600, 67200, 76800, and 115200. For synchronous DCE ports, the same rates apply up to and including 57600 (56K) baud. The default value is 9600. A special value “dt9001” (without quotes) should be entered if the port is being used to connect to a **9001**.

The **dbits=<5|6|7|8>** option specifies the number of data bits in an asynchronous word. It excludes start, stop, and parity bits.

The **parity=<even|odd|none>** option specifies the parity of an asynchronous word.

The **stop=<1|1.5|2>** option determines the number of stop bits for asynchronous ports.

The **attn=<1BRK|2BRK|NONE|char>** sets the attention character. This is a character that when typed will interrupt the local session. The **1BRK** option specifies a single break. The **2BRK** option specifies two breaks within a short period. The **NONE** option specifies that no attention character is defined. Finally, any ASII character may be used as the attention. It should be entered in decimal ASCII representation.

The **flow=<XON|HW|none>** option determines the flow control for the port. The **XON** option uses XON/XOFF in-band flow control characters. The **HW** option uses the CTS and RTS leads for flow control. All flow control is disabled when the “**none”** option is used.

The **cug=[+|-]<CUG_num>** option allows the inclusion or deletion of a Closed User Group in the list of CUGs assigned to the user port. The "**+**" will add the **<CUG_num>** to the CUG list. The "**-**" is used to delete the **<CUG_num>** from the list.

The **crfix=< TRANS | NONULL >** option accommodates an anomaly in some early variants of telnet implementation on UNIX systems, which insert a NULL character in the data stream after a carriage return. Most end devices are not affected by this NULL character. However, some devices (e.g. the BNS control computer) have erroneous operation if these characters are received. The value **TRANS** indicates transparent operation, where all data received by the **xxxx**, including a NULL after a carriage return, is forwarded to the end device. The value of **NONULL** removes a NULL character immediately following a carriage return. No other NULL characters are affected. The default operation is transparent, and the **crfix** option may only be specified if the protocol selected is asynchronous.

The **crlf=< TRANS | NOLF >** option is used to strip LF (line-feed) after CR (carriage return) in the asynchronous protocol.

The **PDDonCR=< ON | OFF >** option is used in conjunction with the **DEST**, and **DPORT** options to define a permanent destination which is not automatically dialed. The **xxxx** will display a message that the user should enter a "carriage return". Once entered, the permanent destination is defined. This option is used for a secure connection via a network security server. Please note that making the port permanently active with the **PAP** command will over-ride this feature.

The **crypt=< ON | OFF >** option is used to select peer to peer secure cryptography of the session. Both session endpoints should be set identically. When the feature is set **OFF**, there is no cryptography on the session. When the feature is set **ON**, a peer to peer session cryptography is used. The key selection is dynamic, and automatically performed by the **xxxx**.

The **comment="User Comment"** option allows the administrator to post a note related to the user port. The string is double quoted, and may have any length up to sixteen characters between the quotes. Per Port comments can be changed even if the user ports are "in service".

The **moveto=<New Port Number>** option allows the administrator to move this configured port to another port number without re-entering the configuration. The original port number configuration is then deleted.

The **copyto=<Port Number Range>** option allows the administrator to replicate this port exactly on other ports. The **<Port Number Range>** may cross the port being replicated.

The **x25dxe=<DTE | DCE>** option is available only when the port is of type **x25**. It allows changing the logical sex of the interface. Each X.25 interface needs a single DTE and a single DCE. Normally, the network side is the DCE. For some network elements, the converse is true. An example is the LTS, and a #5ESS IOP.

The **x25win=<LAPB Tx Window>** option is available only when the port is of type **x25**. It allows changing the number of frames sent without acknowledgement. The default number is seven per the specification. The **<LAPB Tx Window>** may have a value of one through seven inclusive.

The **x25t1=<T1 Timer Value>** option is available only when the port is of type **x25**. It allows changing the X.25 LAPB T1 protocol timer.

The **x25n2=<N2 Retry Counter>** option is available only when the port is of type **x25**. It allows changing the number of retries at the LAPB layer for protocol operations.

The **x25dar=< ON | OFF >** option is available only when the port is of type **x25**. When enabled, the **BX.25** link layer will be immediately restarted should the peer disconnect. When disabled, the **B)X.25** link layer remains in disconnect mode pending further action from the peer. The option was added for TR-TSY-000385 AMATPS interfaces.

The **x25pass=< OFF | DFLT | "Password String" >** option is available only when the port is of type **x25**. This option allows the setting of a **BX.25** I-Frame Password for the link. When set to **OFF**, the link does not issue nor does it expect an I-Frame Password. When the **DFLT** option is set, the TR-TSY-000385 AMATPS passwords are installed. Otherwise, a custom password may always be configured as a double quoted string. Specifics of this interface may be found in **BX.25** Issue 3.

The **x25xid=< XID Link ID >** option is available only when the port is of type **x25**. This option allows the setting of the XID link ID to be used when BX.25 I-Frame Passwords are exchanged. If the **x25pass** option is enabled and the **x25xid** has not been set, the default link id is 4. Specifics of this interface may be found in **BX.25** Issue 3.

The **vc=<Virtual Circuit Number>** is a modifier on the port number when the port is of type **x25**. It is required for configuration options that relate to an individual virtual circuit.

The **vcsvc=< PAD | PASS | RBP | MAC| ISO | SESS >** option determines the type of service for a virtual circuit. The VC must have been specified on the command line. When set to the value of **PAD**, the virtual circuit is terminated in an X.3 PAD. When a value of **PASS** is selected, an X.25 pass-through service is selected. The latter is used for VC aggregation. When a value of **MAC** is selected, a special interface for the MacStar operation system is used. When a value of **RBP** is selected, the *Record Boundary Preservation* protocol is selected. The **ISO** value selects ISO X.25 used with FTAM implementations. The **SESS** value selects the (B)X.25 session layer interface.

The **vcckt=< SVC | PVC >** option determines the operation of a virtual ciruit. When the **PVC** option is selected, connections will not generate call setup or call clear X.25 packets. However, the **xxxx** will still respond to call setup and call clear packets generated by the attached device. When the **SVC** option is selected, a TCP connection to the virtual circuit will generate a call setup X.25 packet transaction. A disconnect will

generate a call clear transaction. If the X.25 device clears the call, the TCP connection will also be dropped.

The **vcwin=<VC Tx Window Size>** specifies the packet layer window size to be used for transmission purposes on the affected VCs. The valid values are one through seven inclusive. The VC must have been previously specified on the command line.

The **vcpkt=< 128 | 256 | 512 | 1024 >** specifies the packet size boundary upon which a packet is generated when the selected forwarding condition is not met. Any such packet will have the "More" bit set to indicate the transaction is not complete.

The **pvcreset=<ON | OFF >** option specifies the operation of a PVC when a connection is made. When set to **ON**, the PVC is issued a RESET upon a user connection. When set to **OFF**, the PVC continues with it's previous state. Some legacy devices cannot tolerate a PVC RESET and this option allows interoperability. The default is to have RESET enabled (ON).

The **pvcrstlnk=< OFF | CONSTDCD | SWDCD >** option specifies the operation of the link supporting the PVC when a connection is made. When set to any value other than **OFF**, the entire link is issued a RESTART upon a connection to the PVC. The PVC itself may also get a RESET depending on the setting of the **pvcreset** option. When set to **OFF**, the link behaves per the relevant (either **X.25** or **BX.25**) specification and no RESTART is issued at user connect. The **pvcrstlnk=SWDCD** option also switches the DCD lead as the BX.25 link layer is controlled. This yields a more effective simulation of a dynamic modem connection as is required by some legacy devices. Some switches (i.e. #5ESS) cannot have the DCD cycled as it will cause the link to not restart. The **pvcrstlnk=CONSTDCD** should be used in that situation as it will maintain the assertion of the DCD lead. The **pvcrstlnk** option is provided strictly for interoperability with select legacy devices. As a general rule, the **pvcrstlnk** feature should remain in the **OFF** condition unless specifically desired. The default is the **OFF** condition.

The **svctclass=< NONE | Throughput >** option specifies a throughput class declared on X.25 call connect, and call accept packets. The throughput class is the same in both transmit and receive directions. As a general rule, it should always be set to **NONE** such that no limiting throughput class is established. All specification allowable values for throughput class are supported. These range from 75bps to 48000bps inclusive. The option is provided for interface to devices that require a throughput class to be explicitly negotiated.

The **padecho=< ON | OFF >** refers to reference #2 in the X.3 parameter list. When set to **OFF**, the PAD will not echo characters back to the IP endpoint. When set to the value of **ON**, all characters are to be echoed back to the IP source.

The **paderase=< NONE | BS | <HEX BYTE> >** option specifies reference #16 in the X.3 parameter list. It is used with manual telnet connections to an X.25 VC. It sets the buffer editing "erase" character. When the special "erase" character is received by the X25PAD for a specific virtual circuit, the previous character in the packet accumulation buffer is deleted. If the **padecho** option was also enabled, a "Backspace Blank Backspace"

sequence is emitted to the user. When the **paderase** option is set to NONE, the PAD will not have a special “erase” character. When the value is BS, it is set to the ASCII backspace character 0x08. Otherwise, any character may be entered as a hexadecimal byte in 0xXX notation. This option is only valid on X.25 virtual circuits configured with the PAD interface.

The **padfwd=<NONE | CR | CRDROP | SEMI | ALL | GRPx>** option specifies reference #3 of the X.3 parameter list. This is the forwarding condition (outside the PAD timer) which will forward data towards the X.25 virtual circuit. A value of **NONE** indicates that there are no character forwarding conditions. A value of **CR** indicates that a carriage return will forward any accumulated data (including the carriage return). A value of **CRDROP** indicates that a carriage return will forward any accumulated data (but not including the carriage return). A value of **SEMI** indicates that a semicolon will forward any accumulated data including the semicolon. A value of **ALL** indicates that all data is to be forwarded immediately. The **ALL** option has the effect of generating single user character X.25 packets on this virtual circuit. The **GRPx** values specify selected groups of forwarding characters. **GRP1** forwards on ESC, BEL, ENQ, and NAK. **GRP2** forwards on DEL, CAN, DC2. **GRP3** forwards on ETX, EOT. **GRP4** forwards on HT, LF, VT, and FF. Multiple forwarding conditions are allowed simultaneously. Setting **padfwd** to a value aggregates with the previous value of **padfwd**. The **padfwd=none** is required to clear the forwarding conditions.

The **padidle=<#X.3 ticks>** parameter refers to reference #4 of the X.3 parameter list. This is the time forwarding condition. When it expires, it will forward any data collected to the X.25 circuit. The timer is reset to the specified timer value whenever a forwarding condition is reached. The value is based on ticks of 1/20th of a second each per the X.3 specification.

The **padbreak=< NONE | INTR | RESET | BRKIND >** parameter refers to reference #7 of the X.3 parameter list. This is the action to be taken when a break indication (a standard Telnet encapsulated value) is received from the remote IP endpoint. A value of **NONE** will ignore the break, and it is deleted from the data stream. The value of INTR will generate an X.25 interrupt packet. The value of **RESET** will generate an X.25 virtual circuit . The value of **BRKIND** will generate an X.29 “indication of break” message on the X.25 virtual circuit.

The **padparity=< TRANS | EVEN | ODD >** parameter is not present in the X.3 parameter list. It allows special parity treatment for interface to network elements that require parity. The default value is transparent operation. The value of **TRANS** sets the operation to be transparent. When the parity treatment is transparent, the data is not modified in either direction. The value of **EVEN** sets the operation to be even parity towards the (B)X.25 device, and stripped parity towards the TELNET. The value of **ODD** sets the operation to be odd parity towards the (B)X.25 device, and stripped parity towards the TELNET.

The **padcrlf=<NONE | RMT | VC | BOTH>** parameter refers to reference #13 of the X.3 parameter list. This is the action to be taken when a CR is received in the data stream from the remote IP endpoint. A value of **NONE** indicates that there is to be no LF (line

feed) insertion. A value of **RMT** will insert an LF following a CR whenever it is sent towards the remote IP endpoint. A value of **VC** will insert an LF following a CR whenever it is sent towards the X.25 virtual circuit. A value of **BOTH** will insert an LF following a CR in either direction.

The **padcmap=< ON | OFF >** option provides the automatic case mapping from lower case to upper case. When the option is set to **ON**, all lower case characters are automatically converted to upper case. When **OFF**, no transformations are performed.

The **padapi=< TELNET | RAW >** option provides a means of selecting the PAD virtual circuit to use **raw** protocol. The **raw** protocol is essentially asynchronous, but without the benefit of Telnet RFC encapsulation. It is used for applications that do not implement the Telnet RFC. The default for this option is to use the Telnet encapsulation.

The **padcug=[+|-]<CUG Number>** parameter allows the virtual circuit connection to be protected by closed user group membership. The closed user group feature is significant only for PAD service. The closed user group address entries are defined with the **cug** command. Any or all closed user group entries may be assigned with a virtual circuit.

The **calling=<DNIC+NTN>** parameter is used to specify the “calling address” on an SVC call setup packet. Most devices do not require a calling address. This option allows the specification for a device which does require same.

The **called=<DNIC+NTN>** parameter is used to specify the “called address” on an SVC call setup packet. Most devices do not require a called address. This option allows the specification for a device that does require same.

The **ext_calling=<OSI NSAP>** parameter is used to specify the “extension calling address” on the SVC call setup packet of an OSI X.25 connection. The option may be deleted with the value ‘delete’. This parameter is only required with the OSI X.25 interface.

The **ext_called=<OSI NSAP>** parameter is used to specify the “extension called address” on the SVC call setup packet of an OSI X.25 connection. The option may be deleted with the value ‘delete’. This parameter is only required wit the OSI X.25 interface.

The **ulen=< UDATA Length >** parameter specifies the length of the user data field to be used in an SVC call setup packet. The default is one byte of value 0xC1.

The **udata#=< Hex Byte >** parameter allows modification of the user data field to be used in an SVC call setup packet. The # may be a number in the range of one through sixteen. The **< Hex Byte >** is of the form 0xXX.

The **vccom=”User Comment”** parameter allows the specification of a comment line for the one or more VCs. The comment may be up to 32 characters in length, and may contain spaces and some special characters. It may not contain an embedded double

quote. Comments are allowed in upper and lower case and may be changed with the port in service. Once entered, the comments are displayed on the port verify.

6.2.2 REMOVE PORT

Syntax: remove port < portnum > < all > < range >

This command is only visible when the unit is logged in. The command takes a user port out of service, and must be performed before any port-level configuration changes can occur. The **<PortNum>** parameter may be a number in the range 1 through the number of ports on the **xxxx**. The **<all>** parameter removes all the serial ports. The **<range>** parameter removes a sequential range of ports.

6.2.3 RESTORE PORT

Syntax: restore port < portnum > < all > < range >

This command, only visible when the unit is logged in, returns a user port to service. The **<PortNum>** parameter may be a number in the range of 1 through the number of serial ports on the **xxxx**. The **<all>** parameter restores all the ports. The **<range>** parameter restores a sequential range of ports.

6.2.4 DISPLAY PORT MEASUREMENTS

Syntax: dmeas port < portnum | all | range >

The **dmeas (dm) port** command is only visible when the unit is logged in. It displays the current port-level measurements for the RS-232C port specified by **<portnum>**, in a formatted report on the console. The **<portnum>** parameter may be a number in the range 1 through the number of ports on the **xxxx**. The **<all>** parameter will display the measurements on all ports. The **<range>** parameter is in the form of “start-end”, and will display the measurements of the ports in that sequential range inclusive.

6.2.5 VERIFY PORT

Syntax: vfy port < portnum | all |range >

This command is only visible when the unit is logged in. It displays the configuration of the port number specified. The **<portnum>** parameter may be a number in the range 1 through the number of ports on the **xxxx**. The **<all>** parameter will verify all ports. The **<range>** parameter will verify a sequential range of ports.

6.2.6 DISPLAY PORT STATUS

Syntax: dstat port < < portnum > | < all > | < range > >

This command is only visible when the unit is logged in. It displays the status of the port number specified. The **<portnum>** parameter may be a number in the range 1 through

the number of ports on the **xxxx**. The **<all>** parameter will display the status of all ports. The **<range>** parameter is in the form of "start-end", and will display the status of the ports in that sequential range inclusive.

6.2.7 DISPLAY CONNECTIONS

Syntax dconn < <Port# Range> | ALL >

The **dconn** command is only visible when the unit is logged in. The command displays the connections between user ports and their destinations. The service state of all ports currently 'In Service' are displayed. For X.25 ports, the connection state of the virtual circuits are displayed. The **dconn** command takes one argument to limit the report size. The argument may be the port number, a range of port numbers, or the value of **ALL** to specify all connections.

6.2.8 DIAGNOSE USER PORT

Syntax: diag port < portnum > < int | ext | all >

The **diagnose (diag)** command is only visible when the unit is logged in. The command accepts arguments to specify a user port on which to perform diagnostics. Two types of diagnostics are available. The internal port diagnostic checks the operation of the hardware exclusive of the cabling, connectors, and drivers. The external port diagnostic checks the operation of everything, including the attached cable. The port ***must*** be out of service to diagnose.

The **<port_num>** parameter specifies the RS-232C user port. The diagnostic type is either **INT** for the internal test, **EXT** for the external test, or **ALL** for both the internal and external tests.

6.2.9 DISCONNECT USER PORT

Syntax: disc port < portnum >

The **disc** command is only visible when the unit is logged in. If an IP stand-alone port is in service, any existing circuit established via the port will be dropped. This is useful in IP networks when the remote peer vanishes due to a remote reboot or a network error. It is essentially equivalent to the **remove port** + **restore port** command sequence.

The **disc** command will always prompt for a password for validation purposes even if the administrator is logged at the appropriate level or higher.

6.2.10 X.25 Protocol Analyzer Snooper

Syntax: snoop <X.25 Port #> <L2 | OFF | <VC Range>> [verbose]

The **snoop** command is only available to X.25 ports. It implements the X.25 protocol analyzer. The **snoop** command may be invoked multiple times with the results aggregating. Every time the **snoop** command is invoked, the relative timestamp is set to zero. The **<x.25 Port #>** is the number of the port to be snooped. The port must be of **type=x25**. The parameter of **L2** will select snooping at the LAPB layer. Both transmit and receive directions will be displayed. The parameter of **<VC Range>** allows the

specification of one or many virtual circuits on the port. This snooping is performed at the packet layer.
Normally, the packet control and size is displayed in short format. If all of the bytes in the packet are desired, the **[verbose]** option may be specified.
In order to disable snooping on one or more components of an X.25 port, the **OFF** option is specified. The **OFF** parameter will disable snooping at all levels on the specified X.25 port.

6.2.11 E2A Head of Bridge Analyzer Snooper

Syntax: snoop <E2AHOB Port #> <HOB | OFF | <RMT Range>> [verbose]

The **snoop** command is only available to **E2AHOB** ports. It implements the E2A Head of Bridge protocol analyzer. The **snoop** command may be invoked multiple times with the results aggregating. Every time the **snoop** command is invoked, the relative timestamp is set to zero. The **<E2AHOB Port #>** is the number of the port to be snooped. The port must be of **type=E2AHOB**. The parameter of **HOB** will select snooping at the Head of the bridge, the serial port. Any messages received will be displayed, and analyzed. The remote identifiers to which the message is sent is also identified. The parameter of **<RMT Range>** allows the specification of one or many remotes on the port. The numbering is fixed according to the TCP listen port. When selected, the response messages from the remotes are also displayed.
If all of the bits in the E2A word and message are desired, the **[verbose]** option may be specified.
In order to disable snooping on one or more components of an **E2AHOB** port, the **OFF** option is specified. The **OFF** parameter will disable snooping at all levels on the specified **E2AHOB** port.

6.2.12 E2A Head of Bridge Mapping Functions

Syntax: map <E2AHOB Port #> [CLEAR | ADDR | TIMEOUT]

The **map** command is only available to **E2AHOB** ports. The **xxxx E2AHOB** vertical service creates and manages a dynamic E2A address map. This allows the remote E-Tails to be positioned anywhere in the bridge chain, and not necessarily at the end device. Further, it does not require any configuration due to its dynamic nature. The address map is used to send the E2A traffic to just a single remote and thereby minimize the network overhead.

The **map** command will display the dynamic E2A address map. All 256 E2A addresses on the virtual tree are displayed in a 16 x 16 grid. The value of "." Indicates that this E2A address is not known at the present time. A numeric value indicates the remote number that contains the E2A address. Note that a remote number may contain just one address, the entire E2A address range, or any other permutation. E2A addresses are unique and will never be contained by more than one remote.

When the **map** command is invoked without arguments, it will display the E2A address map. This is exactly the same function as if the **addr** argument has been provided.

When the **map** command is invoked with the timeout argument, a similar 16 x 16 grid is displayed that contains the number of message timeouts from the remote since last cleared. In the timeout grid, the value of "." Represents the value zero, and "*" represents a value greater than 99. Numeric values were not used for zero to enhance readability as this grid tends to be sparse.

When the **map** command is invoked with the argument of clear, both the address map and the timeout grid are manually cleared. All of the E2A addresses are then acquired dynamically and the map is rebuilt.

6.2.13 Configuring User Prompt

Syntax: uprompt ["User Prompt" | STD]

The **uprompt** command command supports custom user prompting for ports of **type=orig**. In the default condition, a user is prompted with a **xxxx Destination>** prompt string where **xxxx** is the actual device number. If the **uprompt** command is issued with a double quoted string, that string is presented as the user prompt without the double quotes. The maximum size of the prompt string is 31 characters. The value of **STD** returns the **xxxx** user prompt to its default, or standard, configuration.

6.3 IP-GATE PORT COMMANDS

These commands are used to configure the operation of the single **IP-GATE** port on the **4180**. There are two basic objects to be configured. The first, the screening/routing table, determines which packets will be directed to the outgoing path. The second is the specification of the path across the IP infrastructure to either a stand-alone **IP-GATE**, the **IP-GATE** port on another **4180**, a **4000**, or a **6xxx Network Processor** running **IP-FANOUT.** Although the command structure has been designed to accommodate multiple paths, only a single path (i.e. idx=0) is supported at the present time.

6.3.1 IPGATE ROUTE

Syntax: ipgate route < idx = k > [addr = < ipaddr >]
[mask = < submask >]
[path = < path_idx >]
[act = < rte | drop | del>]

The **ipgate route** command builds the screening and routing table for the ***IP-GATE*** port. This table may have up to 8 entries, indexed 0-7 by the **idx** parameter. Each entry is for a range of IP addresses (specified by the **addr** and **mask** parameters), and an action to perform (specified by the **act** parameter) if the packet's destination address falls into this range. These entries have ***precedence***, i.e., entry 0 is evaluated before entry 1, etc., as each outgoing packet is inspected, and the indicated action is immediately performed when a match is found. If a match occurs on an entry for which **act=RTE**, the packet is routed. If **act=DROP**, the packet is explicitly dropped. If no entry in the table matches the packet's destination IP address, the packet is dropped and an exception is logged. Setting the **act** parameter to **DEL** deletes the entry.

Since only one path is available, the **path** parameter has a default value of 0, and should be left that way for correct operation.

For some example route-table configurations, please refer to the **IP-GATE** User Manual.

6.3.2 IPGATE PATH

Syntax: ipgate path <idx=k> [type=<ORIG|RCV|NONE>]
[ipaddr=<ip_addr>]
[dport=<TCP Port>]
[hport=<TCP Port>]
[fmt=<STD | AMAS>]

The **ipgate path** command configures a private tunnel through the IP infrastructure. The **idx** parameter must take on the value of **0** at this time.

When **type=ORIG**, the **IP-GATE** port will be the originator of a TCP/IP circuit via the IP infrastructure. In this case, the **ipaddr** and **dport** parameters represent the remote end of the tunnel.

When **type=RCV**, the **IP-GATE** port will wait for the arrival of a TCP/IP connection request. In this case, **hport** specifies the TCP port to be used by the remote end to originate the path (using the IP address of the **4180** unit).

The **fmt=STD** selects the standard IP-GATE interconnection protocol. The **fmt=AMAS** allows the IP-GATE to be used in conjunction with the TSR to connect directly to a Lucent Anymedia COMDAC via a T1 timeslot for network transport.

A **type** of **NONE** indicates that the path is not usable.

6.3.3 IP-GATE PORT

Syntax: IPGATE PORT [addr=<ipaddr>]
[mask=<submask>]
[gateway=<ipaddr>]
[comment="User Comment"]

The **ipgate port** command configures the ***IP-GATE*** port as an endpoint on the virtual private network formed by the path between two LAN segments. It specifies a private IP address (**addr**) and sub-net **mask** used only to allow the ***IP-GATE*** port to be "pinged" for diagnostic purposes.

The **gateway** parameter specifies the address of the gateway router (if any) on the LAN segment to which the ***IP-GATE*** port is connected.

The **comment** field may be up to sixteen characters between the quotes. The comment can be changed even if the user is "in service"

6.3.4 REMOVE IP-GATE

Syntax: remove ipgate

The **remove** command is only visible when the unit is logged in. When used with an argument of **ipgate**, it takes the **IP-GATE** port out of service. This command must be performed before any **IP-GATE** port-level configuration changes can occur.

6.3.5 RESTORE IP-GATE

Syntax: restore ipgate

The **restore** command is only visible when the unit is logged in. When used with an argument of **ipgate**, it returns the **IP-GATE** port to service.

6.3.6 VERIFY IP-GATE

Syntax: vfy ipgate

The **vfy** command is only visible when the unit is logged in. When used with an argument of **ipgate**, it displays the configuration of the **IP-GATE** port in a formatted report on the console.

6.3.7 DISPLAY IP-GATE STATUS

Syntax: dstat ipgate

This command is only visible when the unit is logged in. It displays the current status of the **IP-GATE** port in a formatted report on the console.

6.3.8 DMEAS IP-GATE

Syntax: dm ipgate

The **dm** command is only visible when the unit is logged in. When using an argument of **ipgate**, the command displays the current ***IP-GATE*** port measurements in a formatted report on the console.

6.3.9 DISCONNECT IP-GATE

Syntax: disc ipgate

The **disc ipgate** command is only visible when the unit is logged in. If the ***IP-GATE*** port is in service with a TCP/IP type path, the existing connection will be dropped. This is useful in IP networks when the remote peer vanishes due to a remote reboot or a network error. It is essentially equivalent to the **remove** + **restore** command sequence.

6.3.10 DISPLAY IP-GATE ARP CACHE

Syntax: dcache

The **dcache** command is only visible when the unit is logged in. The command has no arguments.

The **dcache** command formats a report of the current contents of the **IP-GATE** ARP cache. The **IP-GATE** ARP cache is dynamically assembled during the operation of the **IP-GATE** port. The **IP-GATE** ARP cache may be cleared by using the **clear cache**

command. If the ARP cache is cleared, it will be re-assembled by the **IP-GATE** using traffic present on the **IP-GATE** port.

7 SNMP

The **xxxx** SNMP V1 agent supports a multitude of SNMP MIB variables, SNMP *Traps*, and *Set* and *Get* operations.

7.1 SNMP Version 1 Commands

Command	Operational Result
Get	Requests the values of one or more Management Information Base (MIB) variables.
GetNext	Enables MIB variables to be read sequentially, one variable at a time.
Set	Permits one or more MIB values to be updated.
GetResponse	Used to respond to a Get, GetNext, or Set.
Trap	Indicates the occurrence of a predefined condition.

7.2 xxxx SNMP MIB Variable Database

RO = Read-Only Variable
R/W = Read/Write Variable
SIV = Storage is Volatile

MIB Variable Number	Name	MIB	Console Equivalent	Access	Notes
1.3.6.1.2.1.1.1.0	SysDescr	MIB-II	Banner Message	RO	
1.3.6.1.2.1.1.2.0	SysObjectID	MIB-II	None	RO	
1.3.6.1.2.1.1.3.0	SysUpTime	MIB-II	None	RO	
1.3.6.1.2.1.1.4.0	SysContact	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.5.0	SysName	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.6.0	SysLocation	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.7.0	SysServices	MIB-II	None	RO	
1.3.6.1.2.1.4.1.0	IpForwarding	MIB-II	None	RO	
1.3.6.1.2.1.4.2.0	IpDefaultTTL	MIB-II	None	RO	
1.3.6.1.2.1.4.3.0	IpInReceives	MIB-II	Number of Ethernet Pkts Rcvd	RO	
1.3.6.1.2.1.4.4.0	IpInHdrErrors	MIB-II	Nbr of Packets w/Header Errs	RO	
1.3.6.1.2.1.4.5.0	IpInAddrErrors	MIB-II	Nbr Rx Packets w/Wrong Addr	RO	
1.3.6.1.2.1.4.6.0	IpForwDatagrams	MIB-II	None	RO	
1.3.6.1.2.1.4.7.0	IpInUnknownProtos	MIB-II	Nbr of Packets w/Unk Protocol	RO	
1.3.6.1.2.1.4.8.0	IpInDiscards	MIB-II	Nbr of Packets Disc due to Resource	RO	
1.3.6.1.2.1.4.9.0	IpInDelivers	MIB-II	Inferred from DMEAS counters	RO	
1.3.6.1.2.1.4.10.0	IpOutRequests	MIB-II	Number of Device Frames Transmitted	RO	
1.3.6.1.2.1.4.11.0	IpOutDiscards	MIB-II	Nbr of Port frames Disc due to Resource	RO	
1.3.6.1.2.1.4.12.0	IpOutNoRoutes	MIB-II	None	RO	
1.3.6.1.2.1.4.13.0	IpReasmTimeout	MIB-II	None	RO	

1.3.6.1.2.1.4.14.0	IpReasmReqds	MIB-II	None	RO	
1.3.6.1.2.1.4.15.0	IpReasmOKs	MIB-II	None	RO	
1.3.6.1.2.1.4.16.0	IpReasmFails	MIB-II	None	RO	
1.3.6.1.2.1.4.17.0	IpFragOKs	MIB-II	None	RO	
1.3.6.1.2.1.4.18.0	IpFragFails	MIB-II	None	RO	
1.3.6.1.2.1.4.19.0	IpFragCreates	MIB-II	None	RO	
1.3.6.1.2.1.4.21.0	IpRoutingDiscards	MIB-II	None	RO	
1.3.6.1.2.1.5.1.0	IcmpInMsgs	MIB-II	None	RO	
1.3.6.1.2.1.5.2.0	IcmpInErrors	MIB-II	ICMP Errors	RO	
1.3.6.1.2.1.5.3.0	IcmpInDestUnreach	MIB-II	None	RO	
1.3.6.1.2.1.5.8.0	IcmpInEchos	MIB-II	Nbr of Pings	RO	
1.3.6.1.2.1.5.9.0	IcmpInEchoReps	MIB-II	None	RO	
1.3.6.1.2.1.6.1.0	TcpRtoAlgorithm	MIB-II	None	RO	
1.3.6.1.2.1.6.2.0	TcpRtoMin	MIB-II	None	RO	
1.3.6.1.2.1.6.3.0	TcpRtoMax	MIB-II	None	RO	
1.3.6.1.2.1.6.4.0	TcpMaxConn	MIB-II	None	RO	
1.3.6.1.2.1.6.5.0	TcpActiveOpens	MIB-II	None	RO	
1.3.6.1.2.1.6.6.0	TcpPassiveOpens	MIB-II	None	RO	
1.3.6.1.2.1.6.7.0	TcpAttemptFails	MIB-II	None	RO	
1.3.6.1.2.1.6.8.0	TcpEstabResets	MIB-II	None	RO	
1.3.6.1.2.1.6.9.0	TcpCurrEstab	MIB-II	None	RO	
1.3.6.1.2.1.6.10.0	TcpInSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.11.0	TcpOutSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.12.0	TcpRetransSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.13.X	TcpConnTable Entries	MIB-II	None	RO	
1.3.6.1.2.1.6.14.0	TcpInErrs	MIB-II	None	RO	
1.3.6.1.2.1.6.15.0	TcpOutRsts	MIB-II	None	RO	
1.3.6.1.2.1.7.1.0	UdpInDatagrams	MIB-II	Derived from other Counts.	RO	
1.3.6.1.2.1.7.2.0	UdpNoPorts	MIB-II	Non-Peer and Spurious UDP errors	RO	
1.3.6.1.2.1.7.3.0	UdpInErrors	MIB-II	Frame Errors	RO	
1.3.6.1.2.1.7.4.0	UdpOutDatagrams	MIB-II	Frames Sent, Keep Alive Messages sent, etc.	RO	
1.3.6.1.2.1.7.5.X	udpEntry Table	MIB-II	None	RO	
1.3.6.1.2.1.11.1.0	SnmpInPkts	MIB-II	None	RO	
1.3.6.1.2.1.11.3.0	SnmpInBadVersions	MIB-II	None	RO	
1.3.6.1.2.1.11.4.0	SnmpInBadCommunityNames	MIB-II	None	RO	
1.3.6.1.2.1.11.5.0	SnmpInBadCommunityUses	MIB-II	None	RO	

1.3.6.1.2.1.11.6.0	SnmpInASNParseErrs	MIB-II	None	RO	
1.3.6.1.2.1.11.30.0	SnmpEnableAuthenTraps	MIB-II	None	R/W	SIV
1.3.6.1.2.1.11.31.0	SnmpSilentDrops	MIB-II	None	RO	
1.3.6.1.2.1.11.32.0	SnmpProxyDrops	MIB-II	None	RO	

7.3 Supported Traps

Alarm Text	Severity	Trap Type	Notes
None	N/A	ColdStart	Generated when the unit starts up
None	N/A	AuthFail	SNMP Authorization Failure

8 ALARMS

The following table lists alarm types generated by the **xxxx**. Alarms are visible at the console and via StarKeeper® II NMS.

Alarm	Severity
LAN Link is Down	MAJOR
LAN Link is Up at 10Mbps.	INFO
LAN Link is Up at 100Mbps.	INFO
User Requested Reboot in Progress	INFO
Invalid Login Attempt.	MINOR
Invalid Password Change Attempt.	MINOR
SNMP Trap Manager not reachable (ICMP).	INFO
ICMP Destination Unreachable Msg Received.	MINOR
Over-Temperature Condition Detected.	MAJOR
Over-Temperature Condition Cleared.	INFO
High Temperature Condition Detected.	MINOR
High Temperature Condition Cleared.	INFO
Port XXX received a call from XXX.XXX.XXX.XXX outside CUG list.	MINOR
Serial Number is not valid. Module defective.	MAJOR
Console session in-activity timeout.	INFO
Password Reset Attempt Failed.	MINOR
User Port XX disconnected. Half Open TCP error.	INFO
Gate Path XX disconnected. Half Open TCP error.	INFO
Duplicate IP address @ MAC XXX.XXX.XXX.XXX.XXX.XXX	MAJOR
TSR Loss-of-Frame Detected	MINOR
TSR Loss-of-Frame Cleared	INFO
Insufficient Administrative Authority	MINOR
Installation Attempt Failed.	MINOR
The database is being automatically converted.	INFO
Warning: Database appears corrupted. Repair Attempted.	MAJOR
Warning: Database is corrupted. Not Repairable.	MAJOR

8.1 Major Alarms

A major alarm indicates a serious, service-degrading condition.

8.2 Minor Alarms

A minor alarm indicates a secondary or transient error that is not likely to affect overall service unless multiple minor alarms are issued. In this case, a serious condition exists that may affect overall system performance.

8.3 Info Alarms

An information alarm is a message that does not necessarily require attention. It typically is important for network administration, but does not adversely affect service.

9 MODULE MEASUREMENTS

This appendix itemizes the measurements available using the display measurements (**dm**) command with the **mod** option. These are unit-level measurements. The base measurements are always displayed; the error and exception counters are only displayed if nonzero.

Interface	Type	Protocol	Description
LAN	Base	All	Number of LAN Packets Received
LAN	Base	All	Number of LAN Packets Transmitted.
LAN	Except	All	Number of ICMP Echo Requests Received.
LAN	Error	All	Number of Ethernet Discards (Resource).
LAN	Error	All	Number of Late Collisions (TX).
LAN	Error	All	Number of Under-run. (TX).
LAN	Error	All	Number of packets which exceeded the Retry Limit (TX).
LAN	Error	All	Number of Carrier Sense Lost (TX).
LAN	Error	All	Number of Frame Collisions (RX).
LAN	Error	All	Number of Receiver Overruns (RX).
LAN	Error	All	Number of Receive CRC Errors. (RX).
LAN	Error	All	Number of Short Frame Errors. (RX).
LAN	Error	All	Number of Non-Aligned Frame Error. (RX).
LAN	Error	All	Number of Frame Length Violations. (RX).
LAN	Error	All	Number of Unsupported Protocol Frames. (RX).
LAN	Error	All	Number of Invalid UDP frames. (RX).
LAN	Error	All	Number of Rx Frames w/IP Header Checksum Errors. (RX).
LAN	Error	All	Number of Rx Frames w/ICMP Checksum Errors. (RX).
LAN	Error	All	Number of ICMP Unreachable Destination Messages (RX).
LAN	Error	IP-DSU	Number of Rx Frames from Non-Peer Entity.
LAN	Error	All	Number of Unknown ICMP Messages. (RX).
LAN	Error	IP-DSU	Number of Packets lost from TTL Network Error. (RX).
LAN	Error	All	Number of Packets with wrong IP Destination Address (RX).
LAN	Error	All	Number of Rx Packets with Unknown ARP Operations. (RX).
LAN	Error	All	Number of Bad ARP Reply Packets Received.
LAN	Error	All	Number of RFC894 Packets with an Unknown protocol type field. (RX).
LAN	Error	All	Number of 802.3 Frames with an Unknown protocol type field. (RX).
LAN	Error	SNMP	Number of SNMP Packets Received outside CUG (RX).

10 USER PORT MEASUREMENTS

This appendix itemizes the measurements available using the display measurements (**dm**) command with the **port** option. These are user-port-level measurements.

Interface	Description
TCP	Number of Intervals with Ingress Data.
TCP	Number of Intervals with Egress Data.
TCP	Number of Intervals with Port errors.

Note: In the measurements above, an interval is defined as 3.2 seconds.

11 IP-GATE PORT MEASUREMENTS

This appendix itemizes the measurements available using the display measurements (**dm**) command with the **ipgate** option. These are path-level measurements.

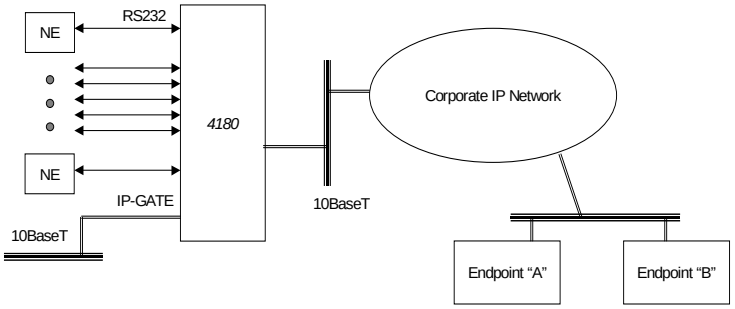
Interface	Description
TCP	Number of Intervals with Ingress Data.
TCP	Number of Intervals with Egress Data.
TCP	Number of Intervals with Port errors.

Note: In the measurements above, an interval is defined as 3.2 seconds.

12 CLOSED USER GROUP DEMO

The **xxxx** supports the notion of ***Closed User Groups (CUGs)*** for IP networking applications. A CUG applies to sessions being established to endpoints on the **xxxx**. This is an important feature for protecting sensitive endpoints in a corporate-wide network without the burden of special "security servers"***.***

The following diagram depicts a corporate IP network infrastructure which may be accessed by endpoints throughout the network. Some endpoints require access to the Network Elements (NEs) reachable via IP-type ports on the **xxxx**, and some endpoints are not to be allowed such access. IP network endpoints, which are allowed to access the NEs, are placed in a CUG to be associated with the appropriate user ports. (The same CUG may be associated with any number of user ports. Any one-user port may belong to up to 16 CUGs.)



Referring to the previous diagram, Endpoint **A** must be allowed access to all the NEs, but Endpoint **B** is not allowed such access. The **xxxx** is configured with CUG 1 with the address of Endpoint **A**, as follows:

cug 1 ipaddr=135.17.59.5 submask=255.255.255.255

Each ***protected*** user port (i.e., those connected to the NEs) is set up with CUG 1 assigned to it, as follows:

port 1 type=rcv hport=26 cug=+1

When Endpoint **A** calls the **xxxx** and TCP port number 26, access to the NE connected to port 1 on the **xxxx** is granted, and everything proceeds transparently. If an endpoint outside CUG 1 (e.g., Endpoint **B**) attempts to call the same TCP port, however, the following happens:

1. The call is terminated during authentication without any data being transported in either direction.
2. An ***authentication alarm*** is generated and sent to an attached Starkeeper, an attached Telnet Console (if any) and the SNMP Trap Manager (if any). The Alarm contains the IP address of the remote endpoint that attempted the unauthorized access.

13 CABLING

13.1 xxxx Ports and the UDS 202T Modem

The UDS 202T modem has an RTS lead that must be either driven, or optioned to be enabled permanently. The **xxxx** Synchronous DTE adapter (depicted in this section) will drive RTS whenever a call is present and therefore DTR is also driven. However, the obsolete AT&T SAM Synchronous DTE adapters had a race condition between RTS and CTS. If the AT&T Synchronous DTE adapters are to be used, the UDS 202T modem must be configured as **permanent** when operating with a SAM or **xxxx**.
In either situation, the "cable type" configured in the **xxxx** or SAM connection is DTE. The adapter presents a 25 pin male connection to the UDS modem.
It should be noted that a UDS 202T in operation with a standard DCN most likely does not have the RTS option configured as permanent. It is recommended that the Synchronous DTE adapter depicted in this section be used for such connections.

13.2 xxxx Ports and AT&T/Paradyne 2024 Modem

The AT&T Paradyne 2024 modem is a 2400 baud synchronous or asynchronous modem used for leased facilities. These modems are used on a great deal of Network Element connections. The AT&T Paradyne 2024 modem is optioned by commands on a front panel via three levers and an "execute" button. The AT&T Paradyne 2024 modem does not provide proper clocking for a SAM or **xxxx** in its default configuration.
There are two methods to provide proper clocking from the AT&T Paradyne 2024 modem. Both methods will work properly with the **xxxx** Synchronous DTE adapter depicted in this section. Only one method will work with the obsolete AT&T synchronous DTE adapter.
The first method, which will operate correctly with the **xxxx** Synchronous DTE adapter, involves setting the modem such that the Tx Clock (Pin 15) is derived from the external clock (Pin 24). This option is configured by setting option **B3** on the AT&T Paradyne 2024 modem from the front panel.
The second method, which will operate correctly with both the **xxxx** Synchronous DTE adapter and the obsolete AT&T Synchronous DTE adapter, involves setting the modem such that the Tx Clock (Pin 15) is a slave of the internal DDS timing. This option is configured by setting option **B2** on the AT&T Paradyne 2024 modem from the front panel.
The default configuration for the AT&T Paradyne 2024 modem is **B1** which is "internal" timing. In this default configuration, the clocks are not properly phased.
The AT&T Paradyne Modem does not have an RTS issue with either the **xxxx** Synchronous DTE adapter or the obsolete AT&T Synchronous DTE adapter.
The configuration of the AT&T Paradyne 2024 is described on pages 28 and 40 of its Operations manual. A synopsis of those instructions are as follows:

The modem is placed into command mode by setting the CMD/Test switch to CMD. The MDCK will display. Press EXEC twice to enable command input. The operating mode will change from MD/O to MD/I.
Using the FWD/BCK key, select the CHOP option, execute, and then enable **B3** (or **B2**) using the EXEC key.

The modem must be taken out of command mode by returning the MDCK display and setting the operating mode from MD/I to MD/O.

13.3 xxxx Ports and General DataComm 201-7 Modems

The General DataComm 201-7 Modem is a 1200 or 2400 baud synchronous or asynchronous modem used for leased facilities. It is present on some Network Element connections. The modem is optioned by DIP switches, and berg jumpers. The 201-7 modem does not provide proper clocking for a SAM or **xxxx** in its default configuration. In order to provide proper clocking, the **xxxx** Synchronous DTE adapter depicted in this section must be used. The obsolete AT&T synchronous DTE adapter will not function properly with the General DataComm 201-7 modem.

The modem is properly configured by setting DIP Switch #9, position #1, to the “external” position. The default is the “internal” position. All other configuration is not altered.

This option will instruct the General DataComm 201-7 to use clock provided on Pin 24 of the interface as its Tx (or Pin 15) clock. This clock is bridged from the Rx Clock (Pin 17) by the **xxxx** Synchronous DTE adapter depicted below. The result is that both clocks are then properly phased.

The General DataComm 201-7 requires RTS asserted before proper operation can proceed. This modem does not allow a permanent enable of that lead. The **xxxx** Synchronous DTE adapter depicted in this section properly asserts RTS when the **xxxx**, **4000**, or **SAM** port has a call active.

13.4 Cabling to a Modem Set

The Cabling to a Modem Set requires the use of a Synchronous DTE adapter. This is not the same as an asynchronous DTE adapter and has a different order code. However, the same Synchronous DTE adapter may be used on SAM64, SAM128, SAM504, **4000**, and **xxxx** ports. The **xxxx** port would be configured with a cable type of DTE.

13.5 Cabling Directly to the Network Element

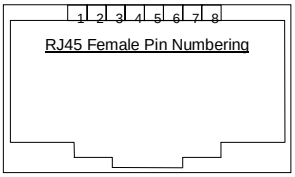
The Network Element is a physical synchronous DTE. It requires a clock source that is usually provided by a modem set. When cabling a **xxxx** directly to the Network Element; it requires the use of a Synchronous DCE adapter. This is not the same as an asynchronous DCE adapter and has a different order code. However, the same Synchronous DCE adapter may be used on the SAM64, SAM128, and SAM504. The **xxxx** port would be assigned a baud rate appropriate for the Network Element (e.g. 2400 baud), and a cable type of DCE.

13.6 Cabling to a Westronic WS2000 E2A Remote

The **xxxx** series is able to accept the E2A protocol on any of its ports. The Westronic WS2000 is an E2A remote interface for discrete scan points.

The Westronic WS2000 presents wire wrap pins and not an actual connector. The cabling is depicted in the diagram below. The port is configured prot=E2A , DXE=DCE, and PAP=ON. The originate and receive options for the port are dependent on the deployment.

4xxx to Westronic WS2000



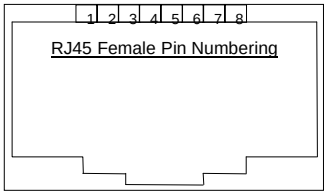
RJ45	WS2000 Wire Wrap Pin
1	GND
2	RTS
3	TxD
4	
5	RxD
6	DCD
7	GND
8	CTS

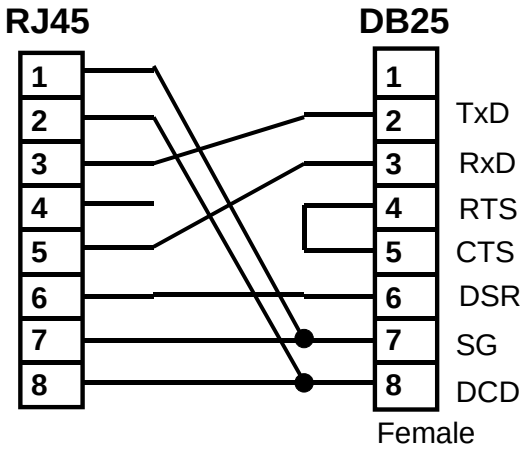
13.7 4000XA, 4180, 4280 - Cabling to an AT&T SAC E2A Remote

The **4000XA, 4180** and **4280** are able to accept the E2A protocol on any of its ports. The AT&T SAC is an E2A remote interface for discrete scan points.

The AT&T SAC presents a DB25 Male connector. A special adapter depicted below must be used to interface to the AT&T SAC. In addition, the port is configured as prot=E2A, DXE=DTE, and PAP=ON. The originate and receive options for the port are dependent on the deployment.

4180 & 4280 to SAC Adapter





13.8 9480, 4284 - Cabling to an AT&T SAC E2A Remote

The **4284** and **9480** are able to accept the E2A protocol on any of its ports. The AT&T SAC is an E2A remote interface for discrete scan points.

These instructions for the interface to the AT&T SAC E2A Remote substantially differs from the **4000**, **4180**, and the **4280**. Specifically, a special interface adapter is no longer required.

The AT&T SAC presents a DB25 Male connector. The adapter used to connect to the AT&T SAC is the standard asynchronous DCE with a DB25 female.

When a **9480** is used, it is connected directly to the AT&T SAC E2A remote without special cabling.

The configuration of the port is as follows:
Port <port num> type=orig prot=e2a
Port <port num> dest=<**E2AHOB** IP Address> dport=<**E2AHOB** TCP Port>
Port <port num> dxe=dce swcar=on
Rs <port num>

In the example above, the **E2AHOB** may be replaced with an **IP-E2A** application instance on a **6xxx**. Please note that the E2A protocol functionality of this release of the **xxxx** requires release 5.1 of **IP-E2A** or later.

13.9 Cabling to an AT&T General Telemetry Processor (GTP)

The AT&T General Telemetry Processor is an E2A remote interface for discrete scan points. Although all the devices covered in this document are able to support E2A on any of its ports, the special requirements of the GTP limits its interface to the **9480** and the **4284** at this time.

The AT&T GTP presents a DB25 Female connector. The adapter used to connect to the AT&T GTP is the standard asynchronous DCE with a DB25 male.

When a **9480** is used, it is connected directly to the AT&T GTP E2A remote without special cabling, but with a DB25 male-to-male gender changer.

The configuration of the port is as follows:
Port <port num> type=orig prot=e2a
Port <port num> dest=<**E2AHOB** IP Address> dport=<**E2AHOB** TCP Port>
Port <port num> dxe=dce swcar=on
Rs <port num>

Due to the nature of TNC to GTP traffic, the **E2AHOB** is the only vertical service that may be used to create the virtual bridge network. The **IP-E2A** application may not be used for this function. This restriction applies only to AT&T GTP, the DPS NTP, and the AT&T TNC endpoints.

13.10 Cabling to an AT&T Telemetry Network Controller (TNC)

The AT&T Telemetry Network Controller (TNC) is an E2A head of bus for multiple GTP and NTP remote interfaces. Although all the devices covered in this document are able to support E2A on any of its ports, the special requirements of the TNC limits its interface to the **9480** and the **4284** at this time.

The AT&T TNC presents a DB25 Male connector. The adapter used to connect to the AT&T TNC is the standard asynchronous DCE with a DB25 female.

When a **9480** is used, it is connected directly to the AT&T TNC without special cabling.

The configuration of the port is as follows:
Port <port num> type=**E2AHOB**
Port <port num> dxe=dce swcar=on
Rs <port num>

Due to the nature of TNC to GTP traffic, the **E2AHOB** is the only vertical service that may be used to create the virtual bridge network. The **IP-E2A** application may not be used for this function. This restriction applies only to AT&T GTP, the DPS NTP, and the AT&T TNC endpoints.

13.11 Cabling to a DPS Network Telemetry Processor (NTP)

The **4000XA**, **4180**, **4280**, **9480** and the **4284** all provide support for a non-standard variant of the E2A protocol used by the DPS NTP.

The DPS Network Telemetry Processor (NTP) is a replacement for the AT&T General Telemetry Processor (GTP). The NTP consists of three shelves: A control Shelf (Shelf 1), a discrete point shelf (Shelf 2), and a TBOS serial shelf (Shelf 3). The internal modem used for E2A transport to the NTP resides in shelf 2 and is connected to the control shelf via a DB9 labeled P3 on the back of the control shelf. This “Modem” card substantially alters the E2A protocol.

Connection of the DPS NTP to the virtual bridge network is as follows:
Remove the DB9 cable from P3 on the control shelf.
Attach a null modem DB9 Male to DB25 Male to P3 on the Control Shelf.
If using a **4000XA**, **4180**, **4280**, or **4284**; attach a DB25 Female Asynchronous DCE adapter to the DB25 end of the DB9 to DB25 cable.
If using a **9480**, attach it directly to the DB25 end of the cable since it provides a female DB25 DCE interface.
The DPS “Modem” card is no longer required and may be removed from the shelf.

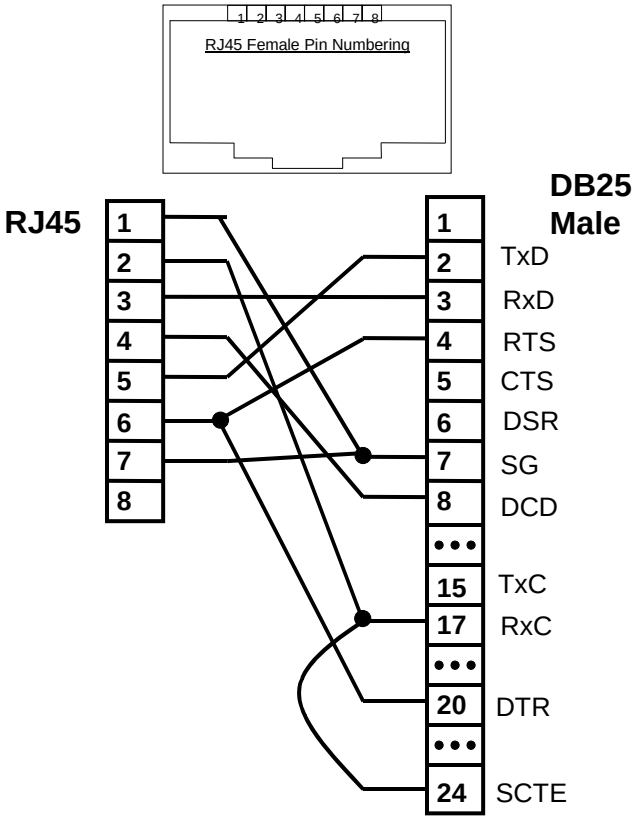
The configuration of the port is as follows:
Port <port num> type=orig prot=**dps**
Port <port num> dest=<**E2AHOB** IP Address> dport=<**E2AHOB** TCP Port>
Rs <port num>

Due to the nature of TNC to GTP traffic, the **E2AHOB** is the only vertical service that may be used to create the virtual bridge network. The **IP-E2A** application may not be used for this function. This restriction applies only to AT&T GTP, the DPS NTP, and the AT&T TNC endpoints.

13.12 The Synchronous DTE Adapter

Depicted below is the cabling description for the Synchronous DTE adapter to be used with **4000XA**, **4180**, **4280**, and **4284** ports configured as a cable type of synchronous DTE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. This adapter is applicable when the port is receiving the clocking to the interface between itself and a device. Generally, this interface adapter is used with Modem connections.

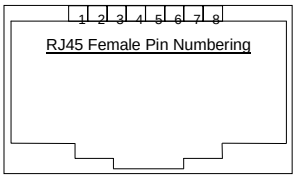
Synchronous DTE Adapter

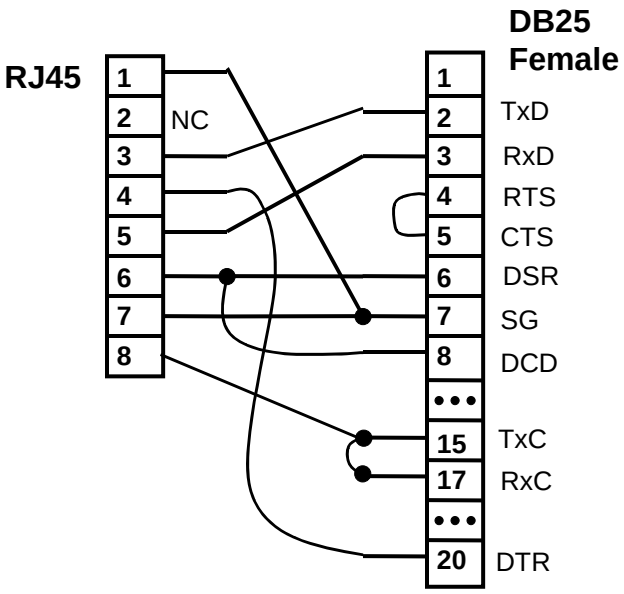


13.13 The Synchronous DCE Adapter

Depicted below is the cabling description for the Synchronous DCE adapter to be used with **4000XA**, **4180**, **4280**, and **4284** ports configured as a cable type of synchronous DCE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. This adapter is applicable when the port is providing the clocking to the interface between itself and a device.

Synchronous DCE Adapter

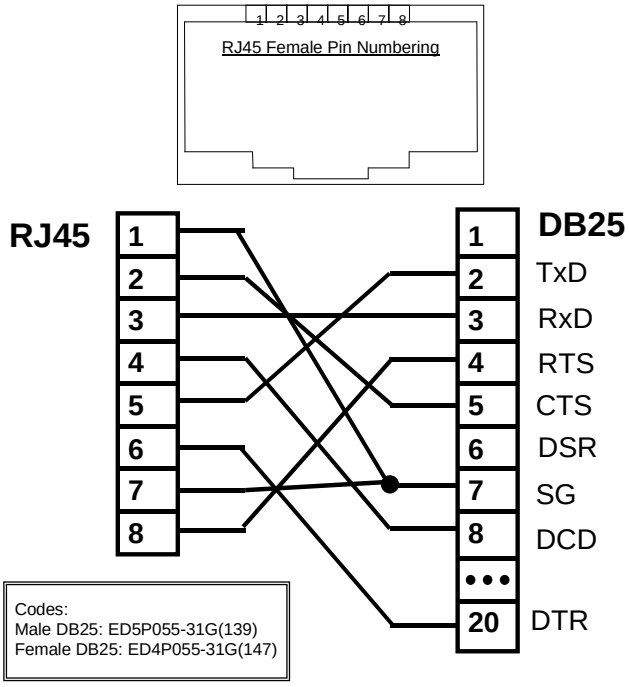




13.14 The Asynchronous DTE Adapter

Depicted below is the cabling description for the asynchronous DTE adapter to be used with **4000XA**, **4180**, **4280**, and **4284** ports configured with a protocol of asynchronous (or raw), and a cable type of DTE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. Generally, this interface adapter is used with Modem connections.

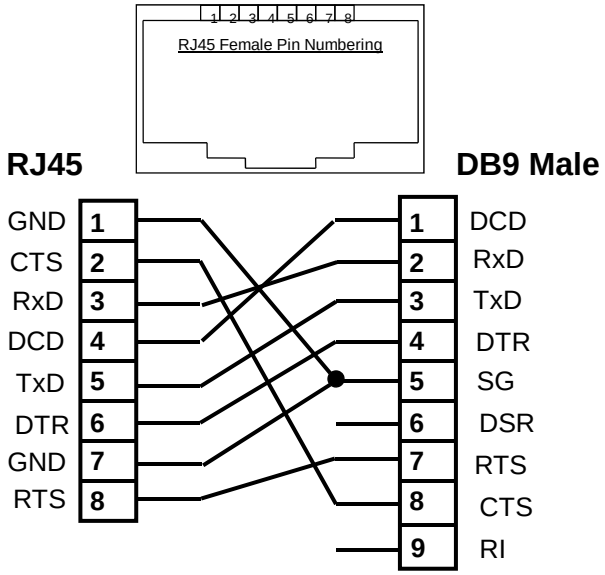
Asynchronous DTE Adapter (AH)

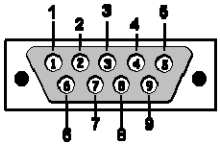


13.15 The Asynchronous DB9 DTE Adapter

Depicted below is the cabling description for the asynchronous DB9 DTE adapter to be used with **4000XA**, **4180**, **4280**, and **4284** ports configured with a protocol of asynchronous (or raw), and a cable type of DTE. The adapter may also be used with SAM64, SAM128, and SAM504 devices. Generally, this interface adapter is used with Modem type devices.

Asynchronous DB9 DTE Adapter



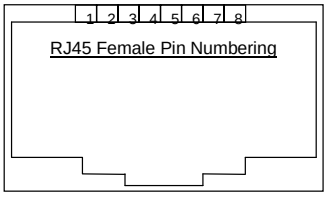


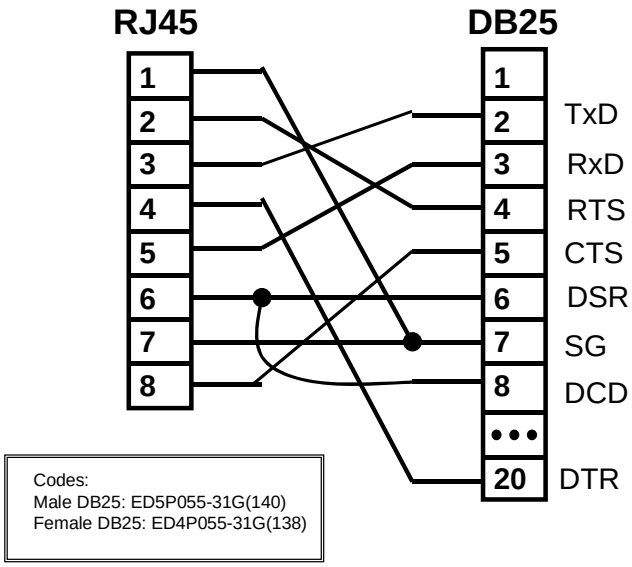
DB9 Male Pin Numbering

13.16 The Asynchronous DCE Adapter

Depicted below is the cabling description for the asynchronous DCE adapter to be used with **4000XA**, **4180**, **4280**, and **4284** ports configured with a protocol of asynchronous (or raw) and a cable type of DCE. The adapter may also be used with SAM64, SAM128, and SAM504 devices.

Asynchronous DCE Adapter (AG)



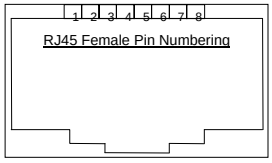


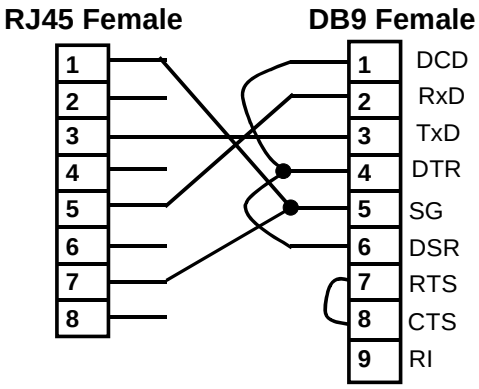
13.17 The DB9 Console Adapter

Some Personal Computers use a 9 pin DB9 interface for serial communications. The terminal emulation programs may require certain lead status. Since console connections are generally implemented as three wire interfaces (i.e. RxD, TxD, and SG); this may pose a problem for the terminal emulation programs.

Below is depicted the wiring of a DB9 adapter which eliminates the problems associated with these terminal emulation programs. It is used with a standard **straight** category 5 RJ45 cable.

DB9 DCE Console Adapter





Note: This cable for use on console ports only.

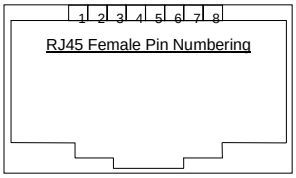
Use with a straight CAT-5 RJ45 cable.

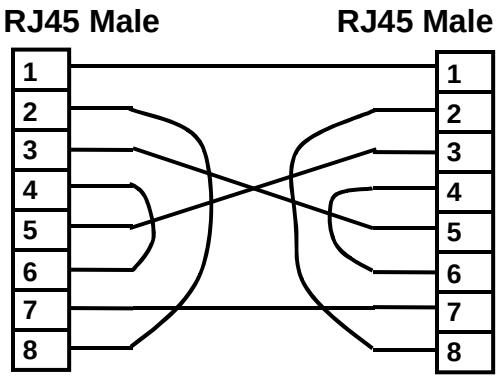
13.18 The RJ45 to RJ45 Crossover Console Cable

The RJ45 to RJ45 console cable implements a three wire interface for attaching to a console on a **4000XA**, **4180**, **4280**, or **4284**. There is signal looping at either end. It is used to connect a serial console directly to a **4000**, **4000XA**, **4180**, **4280**, **4284**, a Datakit SAM port, or a Datakit TY port. No adapter is required. It may also be used in conjunction with an Asynchronous DCE or DTE adapter to provide console interfaces for personal computers or terminals where looped signals are required.

The diagram for the console cable is as follows:

RJ45 to RJ45 Console Cable





Note: This cable for use on console ports only.

Comcode: 408198133

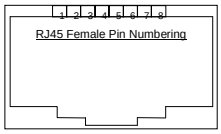
13.19 The RJ45 to 9480 DB25 Console Adapter

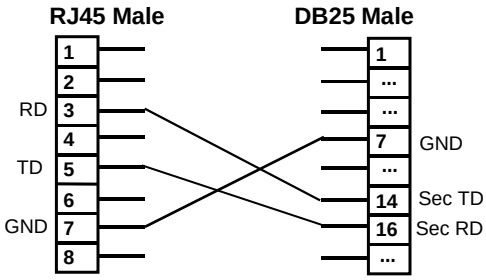
The **9480** implements the serial console as the secondary RS-232 interface on the DB25 connector. It is used only for initial configuration of the IP parameters. Thereafter, the **9480** is connected directly to the Network Element and the serial console is no longer used. The software on the **9480** disables the serial console if it is not used.

The following diagram shows a simple RJ45 to DB25 adapter to connect any **4000**, **4000XA**, **4180**, **4280**, **4284**, Datakit TY, or SAM port to the **9480** console for initial configuration.

The diagram for the console cable is as follows:

RJ45 to DT-9480 Console Adapter



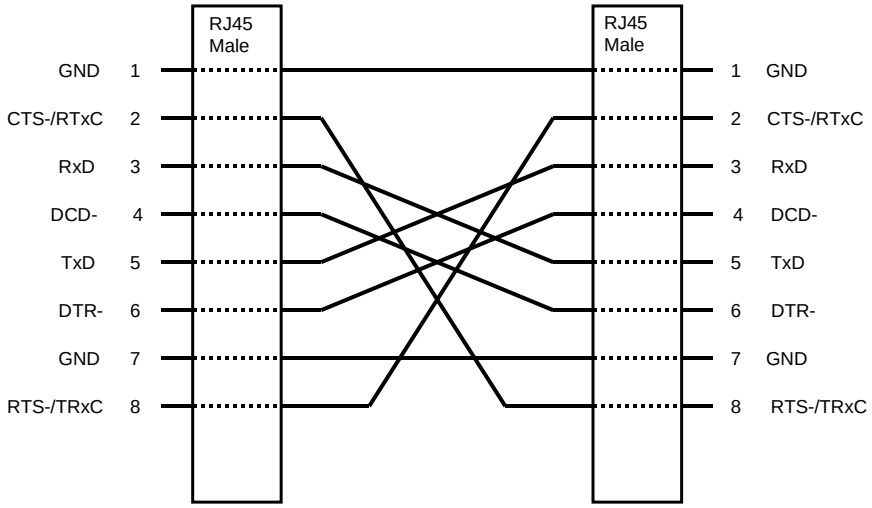


13.20 The RJ45 to RJ45 Full Crossover Cable

It is sometimes useful to interconnect two devices without adapters. The full cross-over cable will accomplish that function and preserve all of the lead functions. It is a generic cable that will work with any DT series, any Datakit/BNS series interface, and many other popular device interfaces.

A diagram of that cable is as follows:

RJ45 Full Cross-Over Cable

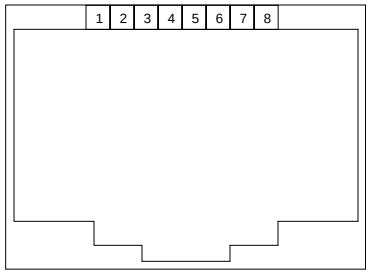


13.21 The RJ45 LAN Crossover Cable

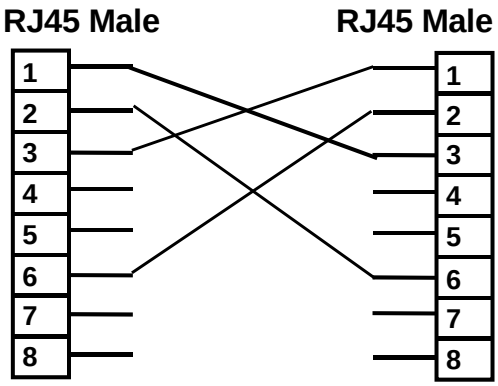
It is sometimes necessary to cross-over the LAN connection. This is used to interconnect equipment without an external Ethernet Hub or Switch. It is used in remote offices to connect the LAN to a home office with or without an IP-FANOUT.

The LAN crossover cable is a standard cable available at any supply outlet. However, it is shown here for informational purposes.

RJ45 Female Pin Numbering



Pin	Symbol	Function	Signal Type
1	Tx+	Data Transmission +	Output
2	Tx-	Data Transmission -	Output
3	Rx+	Data Reception +	Input
4	NC		
5	NC		
6	Rx-	Data Reception -	Input
7	NC		
8	NC		



14 Synchronous Protocols with Recovered Clocks

The ports on a **xxxx** support the option of recovering clocks from the data lines for synchronous protocols. When this occurs, the encoding for these protocols must be either NRZI or a Biphase frequency modulation. The NRZI option is reliable for bit stuffed protocols such as SDLC, but is subject to failure in a BiSync due to the potential for insufficient bit cell transitions. This is not a limitation on the **xxxx** hardware, but rather a fact of the encoding itself. The NRZI encoding on SDLC data streams is by far, the most common variant of these protocols. It is this NRZI encoding which is used on the isochronous LTS connections.

In order to use a **xxxx** port with recovered clocks, it should be programmed with the protocol, the line encoding, the operation on the data, the baud rate, and the recovered clock. Consider the following command:

port 1 prot=sdlc baud=1200 enc=nrzi dxe=dce clk=rcvd fill=flag

This command instructs the **xxxx** that the port is SDLC NRZI with recovered clocks. The baud rate is required in order to properly recover the clocks from the data, and must match the peer. The **dxe=dce** instructs the **xxxx** that it should control CTS from the peer DTEs RTS, and not wait to send data. The **clk=rcvd** instructs the **xxxx** that the clocks are to be recovered from the data rather than on a separate EIA lead. Please note that this configuration would use the asynchronous DCE adapter (i.e. the **AG** adapter). The **fill=flag** option is the default for an SDLC port and specification of the option is not required unless the port had been previously configured otherwise.

Suppose that the port is to be connected to a modem device operating in 2-wire (half duplex) mode, and the port is to be the DTE in that configuration. The **xxxx** port would need to assert RTS and wait for CTS before sending data to avoid corruption on the half duplex interface. The following command would issue that configuration.

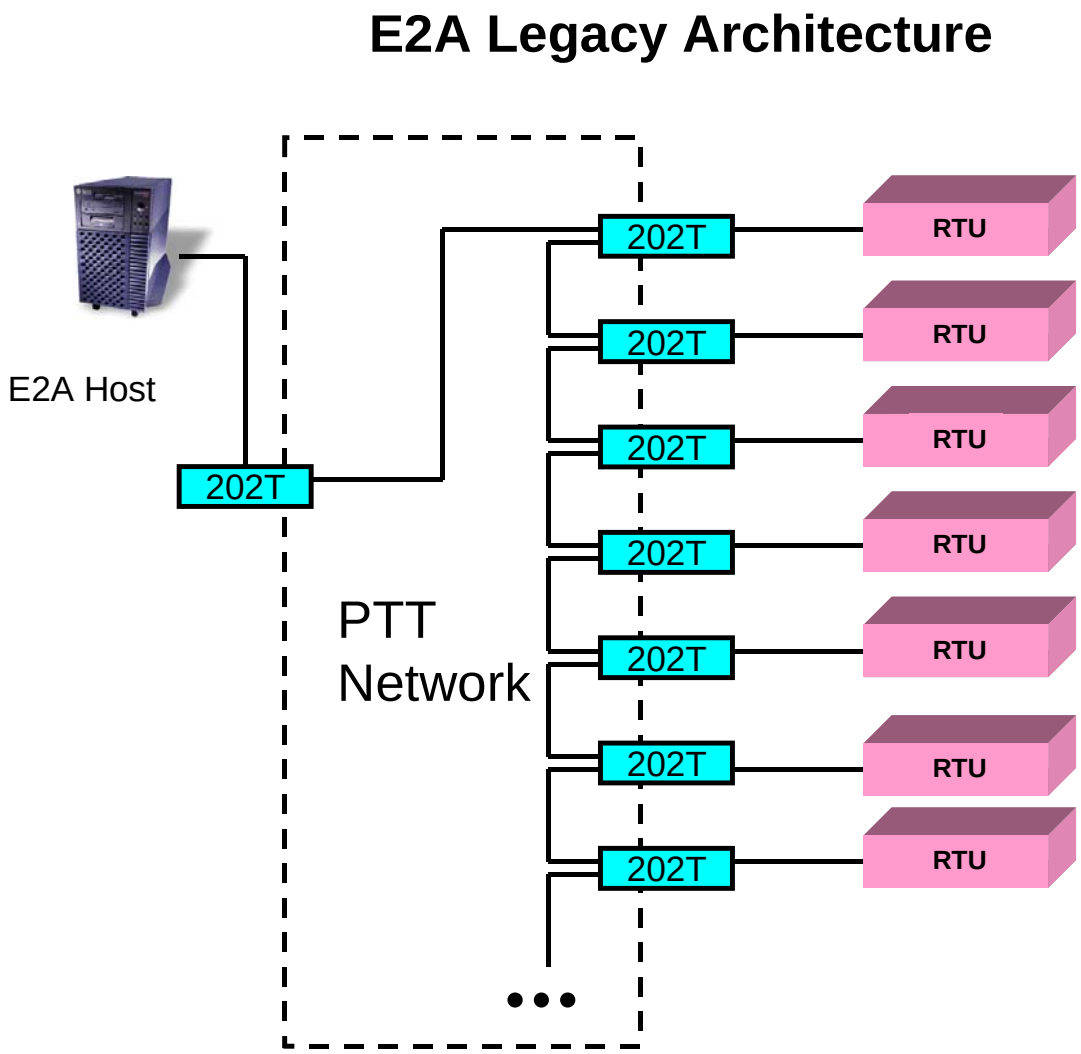
Port 1 prot=sdlc baud=1200 enc=nrzi dxe=dte clk=rcvd fill=mark

Note that the only difference is the **dxe=dte** option. This instructs the **xxxx** to assert RTS when there is data to send, and then wait for CTS to be asserted by the DCE before actually sending the data. The **fill=mark** idles the line between frames in the mark state as opposed to flags. Some modem devices do not handle flag idled lines well. If that is the case, then this option should be used. It doesn't hurt to mark fill on DTE ports. Please note that this configuration would use the asynchronous DTE adapter (i.e. the **AH** adapter).

15 An E2A Head of Bridge Example

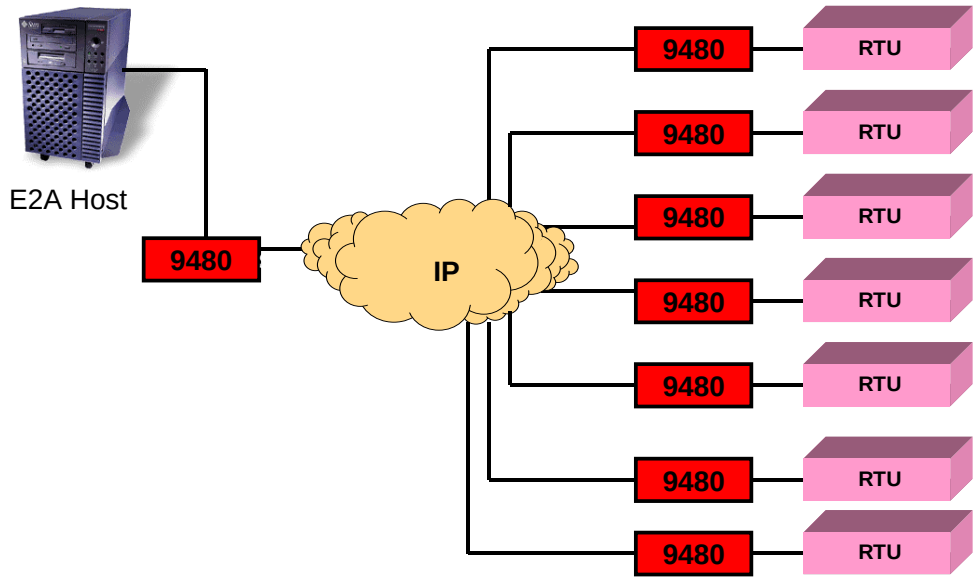
In this section, an example is presented of a deployment for the E2AHOB vertical service of the **4284**, and the **9480**.

Consider the following network using a legacy modem bridge:



The network is transformed into an intelligent switched (not bridged) virtual network at minimal cost using the **9480**. The result follows:

9480 Virtual Bridge Architecture



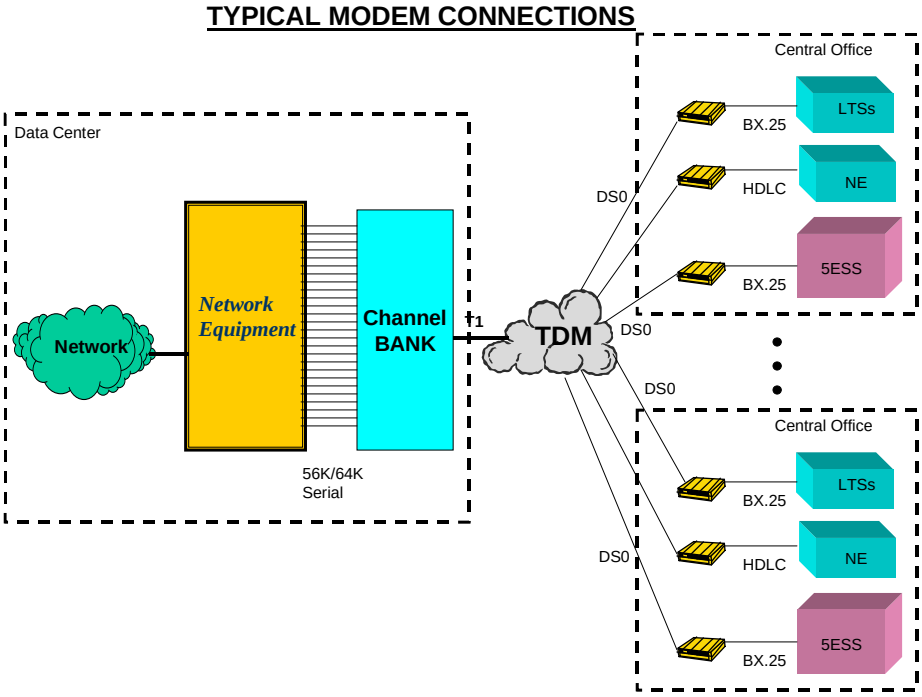
In fact, additional remotes cost **1/4th** the original approach since they would only require a **9480** at the remote end, and the **9480** is **1/4th the cost** of the remote modem alone.

16 4000XA / 4180 Specific Applications

16.1 The 4000XA/4180 as a Channel Bank Replacement

The **4000XA/4180** TSR port may be used as a channel bank replacement. This allows up to 24 individual DS0 connections when the TSR is operating as a T1, and 32 individual DS0 connections when the TSR is operating at E1. The TSR supports sub-channeling on a per timeslot basis.

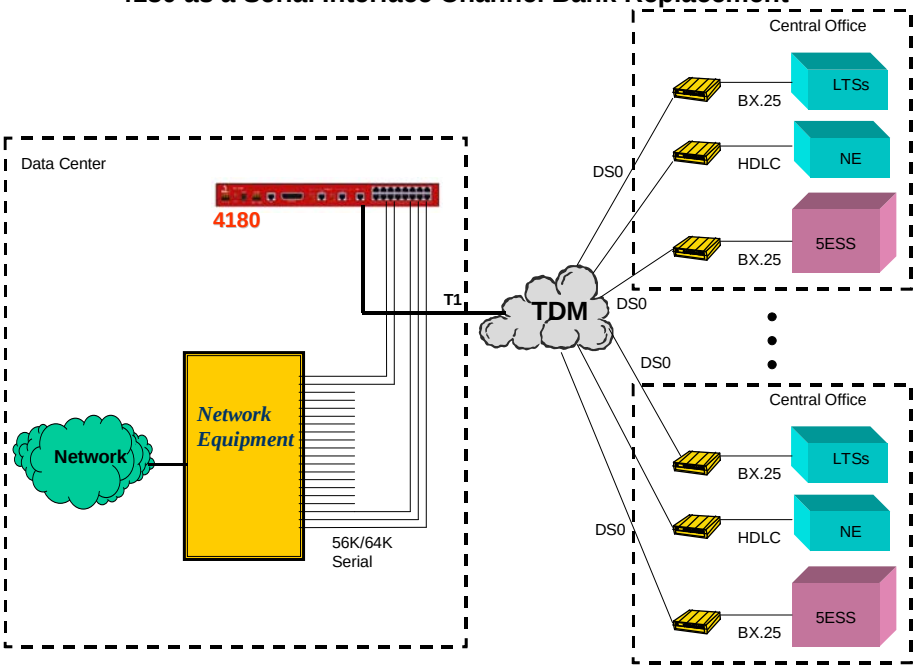
Consider the following depiction of a typical channel bank installation:



In the diagram above, the individual DS0s are joined by the TDM network into a T1 interface to the channel bank. The Channel Bank terminates each DS0 and provides a serial interface to the network equipment. The network equipment requires a serial port for each of these connections.

Now, suppose it was desired to use the **4000XA/4180** as a channel bank replacement as a direct “drop in”. That is, the serial connections are still to be made to the network equipment. That diagram would look as follows:

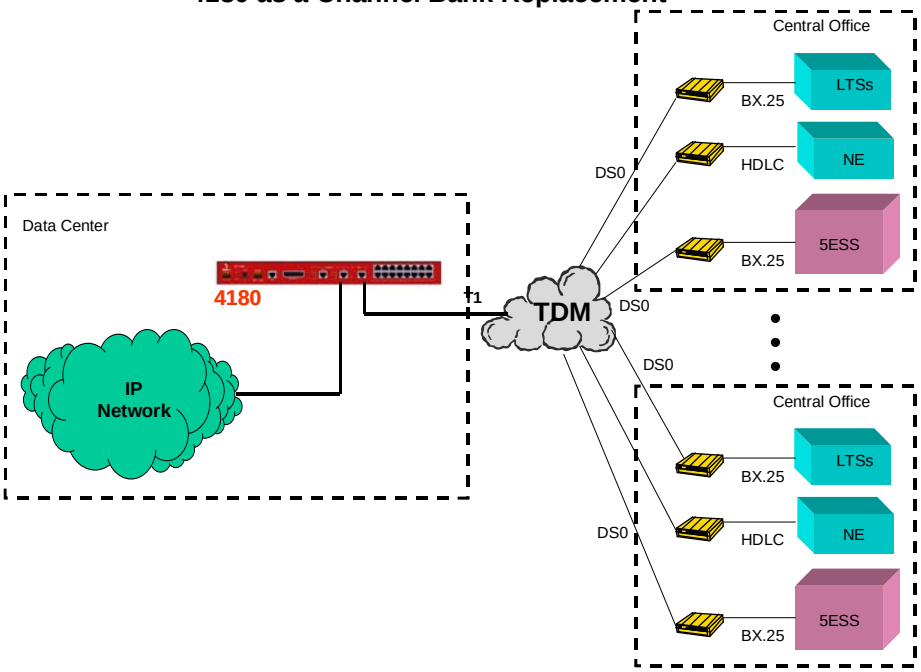
4180 as a Serial Interface Channel Bank Replacement



The TSR is configured to have 24 channels for a T1, and each is given a single timeslot. A connection is made via an internal PDD from a serial port on the **4000XA/4180** and a TSR channel. Since the **4000XA/4180** has 16 serial ports, if more are needed then another device such as a **4000** may be used for the additional serial ports.

A more effective manner is to eliminate the network equipment and the serial connections altogether. The **4000XA/4180** allows the individual TSR channels to be accessed by network endpoints as if they are serial ports. The HDLC is terminated, and standard TCP/IP protocols are used to connectivity. The diagram below is this configuration:

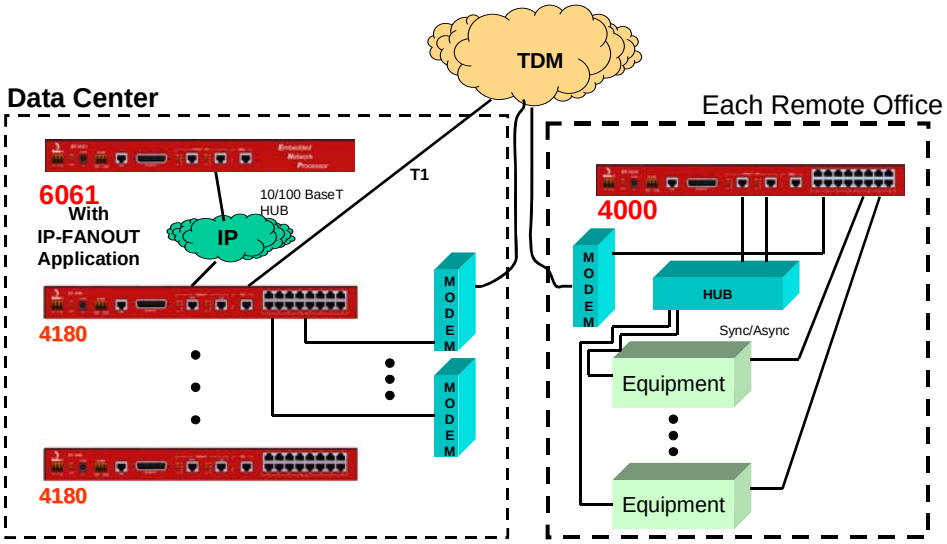
4180 as a Channel Bank Replacement



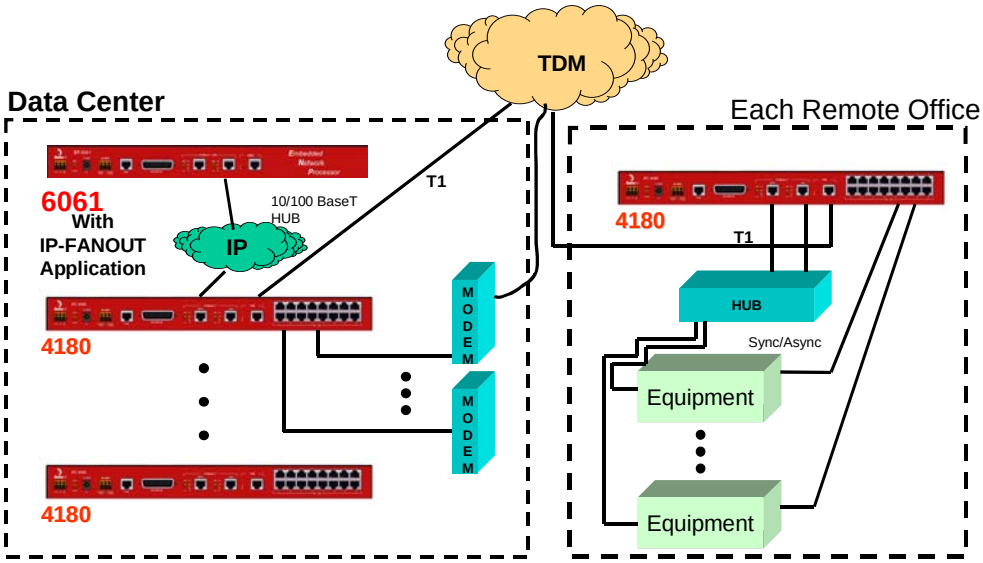
16.2 4000XA/4180 TSR support for IP-FANOUT

The **4000XA/4180** provides many opportunities to optimize the network FANOUT in an economical fashion.

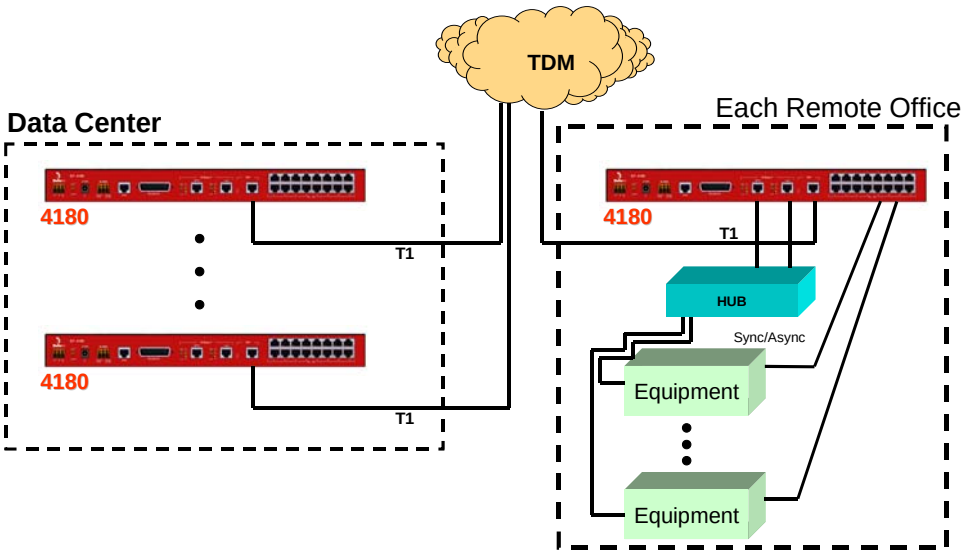
One example is the use of the TSR connections to provide connectivity to the individual remote offices. In conjunction with the serial ports, up to 40 offices (48 using E1) may be connected from a single **4000XA/4180**. A depiction is as follows:



Another possibility is the elimination of the modem interface at the remote office. This is done by using a TSR connection for the remote office as well. The connection may aggregate multiple timeslots up to the full line rate if the remote office traffic demands it. This is depicted in the following diagram.



Finally, the **4000XA/4180** may connect to a remote office by any of its connections on a one for one basis. By using the TSR, a connection with speeds up to T1 (or E1) may be realized. This is especially useful for intelligent LAN bridging where reliability is a concern. That diagram is below.



17 SPECIFICATIONS

17.1 CONSOLE PORT

A standard RS-232C interface that uses binary data interchange between DTE and DCE. This interface uses an RJ45 connector and operates at 9600 bits per second (bps), 8 bits per character, no parity, and one stop bit.

17.2 4000XA / 4180 RS-232/V.35 DB25 SERIAL PORT

The **4000XA / 4180** specific serial port uses a male 25-pin (DB25) connector. The **4000XA / 4180** has reserved this hardware interface for future use.

17.2.1 RS-232-C

The RS232-C interface uses up to 21 signal leads, and operates at data rates from 75 to 19200 bits per second (bps). The **4000XA / 4180** serial ports exceed this specification by allowing data rates up to 115.2Kbps.

17.2.2 V.35

The V.35 interface on the **4000XA / 4180** operates at data rates up to 2.048Mbps. A DB25 female to Winchester-34 male adapter is required between the DB25 connector and the 34-pin V.35 cable.

17.3 4000XA, 4180, 4280, 4284, 9480

The RS-232 serial ports on the **xxxx** are RS-232. They are implemented as RJ45 interfaces on the **4000XA**, **4180**, **4280**, and **4284**. The user port on the **9480** is a DB25. The **xxxx** user ports are RS-232 and provide data rates up to 115.2Kbps. The **xxxx** user ports may be interfaced to V.35 devices with the use of a **9008** adapter. As such, the serial ports will support a V.35 device at rates up to 115.2Kbps.

17.4 10/100 LAN PORT

The **4000XA / 4180** provides two 8-pin LAN modular connector used to interface to a 10/100 Mbps baseband CSMA/CD local area network(s). These are labeled as LAN and GATE to describe their unique function. Each LAN interface on the **4000XA / 4180** is limited to 10BaseT operation.

The **4280**, **4284**, and **9480** each has an 8-pin LAN modular connector is used to interface to a 10/100 Mbps baseband CSMA/CD local area network. The LAN interface is capable of 10/100 operation.

17.5 PHYSICAL DIMENSIONS

4180	Width = 16.9” x Depth = 8.77” x Height = 1.72” (1U)
4280	Width = 16.9” x Depth = 8.77” x Height = 1.72” (1U)
4000XA	Width = 16.9” x Depth = 8.77” x Height = 1.72” (1U)
4284	Width = 6” x Depth = 4.25” x Height = 1.4” (1U w/Mount)
9480	Width = 2.38” x Depth = 3.5” x Height = 0.88”

17.6 ENVIRONMENTAL OPERATING RANGE

Operating Temperature:	5° to 40°C (41°F to 124°F) per GR-63-CORE.
Operating Humidity:	5% to 90% non-condensing per GR-63-CORE.
Altitude:	From 60 m (197 ft.) below sea level to 1800 m (5905 ft.) above sea level and less than 4000 m (13122 ft) derated by 2° C per 300 m per GR-63-CORE.

17.7 POWER REQUIREMENTS

4180 Operating Voltage:	5V @ 800 mA Nominal
Stand-alone AC to DC power supply:	115V @ 48 mA Nominal
	115V @ 90 mA Maximum
Stand-alone DC power supply:	48V @ 104 mA Nominal
	48V @ 195 mA Maximum
Rack-mount DC (six units):	48V @ 624 mA Nominal
	48V @ 1.17 A Maximum
4280 Operating Voltage:	24V @ 167 mA Nominal
Stand-alone AC to DC power supply:	115V @ 48 mA Nominal
	115V @ 90 mA Maximum
Stand-alone DC power supply:	48V @ 104 mA Nominal
	48V @ 195 mA Maximum
Rack-mount DC (six units):	48V @ 624 mA Nominal
	48V @ 1.17 A Maximum
4000XA Operating Voltage:	5V @ 800 mA Nominal
Stand-alone AC to DC power supply:	115V @ 48 mA Nominal
	115V @ 90 mA Maximum
Stand-alone DC power supply:	48V @ 104 mA Nominal
	48V @ 195 mA Maximum
Rack-mount DC (six units):	48V @ 624 mA Nominal
	48V @ 1.17 A Maximum

9480 / 4284 Operating Voltage:

Stand-alone AC to DC power supply:	115V @ 9 mA Nominal 115V @ 15 mA Maximum
Stand-alone DC power supply:	48V @ 21 mA Nominal 48V @ 30 mA Maximum

17.8 REGULATORY INFORMATION

17.8.1 xxxx Stand-Alone

Safety:	UL, CSA, Low Voltage Directive 73/23/EEC
EMC:	FCC Part 15B Class A, ICES-003 Class A, EMC Directive 89/336/EEC
European Teleconnect	TTE Directive TBR 13
NEBS:	Level 3

To maintain compliance with the above-mentioned EMC standards, shielded cables must be used on all **xxxx** interface connections, and the shields must make an electrical connection to the **xxxx**'s grounding system.

17.8.2 FCC Part 68 Information

The **xxxx** complies with Part 68 of the FCC rules. On the bottom of the unit is a label that contains, among other information, the FCC registration number for the **xxxx**. If requested, this information must be provided to the telephone company.

The RJ45-style jack labeled DSU, located on the front of the **xxxx,** has been tested as part of the registration process for FCC Part 68.

An FCC-compliant modular jack is provided with the **xxxx**. This jack is designed to be connected to the telephone network or premises wiring using a compatible modular plug which is Part 68 compliant.

If the **xxxx** causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuation of service may be required. If advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes to its facilities, equipment, operations or procedures that could affect the operation of the **xxxx**. If this happens, the telephone company will provide advance notice, in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced please refer to the warranty section of this user manual. No repairs can be performed by the user going beyond the scope of the troubleshooting section of this user manual.

17.8.3 Industry Canada CS03 Certification Information

NOTICE: The *Industry Canada* label identifies certified equipment. This certification means that the equipment meets the telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s), but does not guarantee that the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect to the facilities of the local telecommunications company. The customer should be aware that compliance with the above conditions may not rule out degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment may give the telecommunications company cause to request the user to disconnect the equipment.

For their own protection, users should ensure that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution is particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

17.8.4 NEBS COMPLIANCE

- **GR-1089-CORE NEBS**
  Section 6 DC Potential Difference
  Section 8 Corrosion Requirements
- **GR-1089-CORE NEBS Level 3**
  Section 2 ESD
  Section 3.1, 3.2 EMI Emissions
  Section 3.3 Immunity
  Section 4 Lightning and AC Power Fault
  Section 5 Steady State Power Induction
  Section 7 Electrical Safety Analysis
  Section 9 Bonding and Grounding
- **GR-63-CORE NEBS**
  Section 2 Spatial Requirements
  Section 4.1.3 Altitude
  Section 4.6 Acoustic Noise
  Section 4.7 Illumination Requirements
- **GR-63-CORE NEBS Level 3**
  Section 4.1.1 Transportation and Storage
  Section 4.1.2 Operating Temperature and Humidity Criteria
  Section 4.2.3 Equipment Assembly Fire Test
  Section 4.3.1 Packaged Equipment Shock Criteria
  Section 4.3.2 Unpackaged Equipment Shock Criteria
  Section 4.4.1 Earthquake Environment and Criteria

Section 4.4.3 Office Vibration Environment and Criteria
Section 4.4.4 Transportation Vibration Criteria

18 HARDWARE WARRANTY

The warranty period for the 9480, 4284, 4180, and 4280 hardware shall be ninety (90) days from the date of shipment from TeleComp R&D or a designated manufacturer. Replacements and repairs are guaranteed for the longer of the remaining original warranty period or 30 days whichever is longer.

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